

# The Chemical Age

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## Taxation and Research

HERE is one item missing from the Budget which has unfortunately been missed from every budget within our recollection. The Chancellor encourages the family man, he encourages the married man, on some occasions he even encourages the income tax payer, he encourages insurance, and he has been known (occasionally) to encourage the consumption of certain alcoholic beverages; but he never encourages research, although it is one of the fundamentals of national prosperity. The report of the department of Scientific and Industrial Research for the year 1934-35, the last report issued, records "signal instances of the achievements of research in the industrial sphere" and by implication deplores the fact that some industries have not yet become "research-minded." The importance of research and of the *habitual* use of science by industry is stressed in a paragraph that bears repetition in extenso. "Two years ago, in urging the importance of an increase in the financial support of Government for the research association scheme, we expressed the opinion that the time was ripe for a forward movement. We are in a position to-day to report evidences of a forward movement, and not only in the industries covered by the research associations. It is of the first importance that this movement should continue to be pressed forward without delay. This is not a case in which time is on our side. The fact that this country has succeeded better than some others in raising herself by her own efforts from the economic depression which has affected the whole world gives her, momentarily perhaps, an opportunity of recovering some of the industrial supremacy she enjoyed until the great war. If the opportunity is to be seized, it will require an intensive application of scientific methods to all those industries which are made possible by our natural resources, our economic situation, and the skill and enterprise of our people." Furthermore, after making a review of certain important industries, the Board was "much impressed" by the inevitable conclusion that "compared with some of their industrial rivals overseas, the scientific outlook of these industries still leaves much to be desired. Neither in the directorates nor among the technical and executive staffs is sufficient weight yet given to scientific attainment and experience." In the words of the report we would reiterate that "This is not a case in which time is on our side."

The prosperity of industry—the goose that lays the golden eggs—must be the first concern of every long-sighted Chancellor. The Department of Industrial and Scientific Research is clearly convinced that industrial prosperity depends upon the application of science. As

compared with the objects that successive Chancellors deem to be worthy of assisting, that of scientific application must rank high, and some might say, pre-eminent. It is, for example, of no use encouraging what the Prayer Book terms "the procreation of children" unless there is adequate industrial prosperity to provide for them when they come to man's estate. Of many ways by which backward industries might be awakened to a due sense of the error of their ways and induced to modify them, and by which those who are treading the straight and narrow path might be encouraged to continue in those ways, the encouragement of research by remission of taxation seems to be the simplest. We understand that there are powerful influences at work that are endeavouring to put forward the case for a rebate of income tax for expenditure upon research.

The difficulty lies in what expenditure should come under this head. The most common suggestion is that it should apply only to monies given to research associations. The D.S.I.R. would evidently be of the same opinion, for in its report it registers its conviction that "advances usually come about in these days by team work rather than through the efforts of individual men of genius," and it urges co-operation in the industrial research movement. No doubt advances made through research associations have this advantage, that they benefit the whole industry, and not any one firm. We suggest, however, that it is not enough for a firm to subscribe to a research association. What is needed is the practical application in the works of the discoveries made; that needs the services of a resident scientific staff who knows the local conditions and is able to appreciate the scientific and technical publications of the association. Exemption should be granted upon the salary of every man on the firm who possessed a university degree in science or its equivalent. That would help to ensure the "habitual use of science in the daily process of manufacture" which the D.S.I.R. tells us, quite rightly, is the only method by which new advantages in knowledge can be turned to practical advantage. We are aware of the valuable work done by others lower in the grade than those mentioned, but without some definite line of demarcation there would be practical difficulties in deciding where the tax should be remitted. There are industries that do not contribute to any research association, for there is no association to which they could contribute. These industries should benefit when they employ skilled scientific assistance, and in the manner here suggested they could receive the necessary encouragement.

## Notes and Comments

### A Hopeful Outlook

SIR Harry McGowan's confident forecast for the current year at the annual meeting of Imperial Chemical Industries on Monday will be interpreted favourably in view of the uncertainties of the international situation. His estimate a year ago that 1935 would be a successful year has proved correct, and he hopes that 1936 will yield similar conditions and similar results. The experience of Imperial Chemical Industries is a fair guide to the experience of industry as a whole, and for that reason Sir Harry's speech must carry considerable weight. He perceives no likelihood of the disappearance of those features of economic nationalism which hamper export trade, and his company has therefore adopted the policy of erecting local factories in those countries where the demand is sufficiently large to justify such a step. This policy must reduce the demand for goods manufactured at home, but there seems to be no alternative if the company is to maintain its international connections. So far as home affairs are concerned, Sir Harry McGowan considers that the Government's defence programme will give a stimulus to industrial activity. The measure of the stimulus, however, will depend to some extent upon whether or not the money for the programme is obtained by diverting it from uses in which it would otherwise be employed. The company itself will benefit, not only from direct orders, but also from its general interest in the great industries of the country, through a derived demand from orders given direct to them. At home, the business of the company so far this year is better than in 1935 and recent employment figures give every hope of continuing steady progress. Abroad, the same political conditions appertain as last year, though there are many people who regard them as worse, but Sir Harry looks to the ability of statesmen abroad to turn to account the deep longings of the people themselves to live at peace with one another and in that peace to carry on their trade and industry.

### Development of Research

A CONSIDERABLE amount of work is devoted in the research department of Imperial Chemical Industries to developing new industrial applications of existing products, as well as in the direction of helping customers in the known uses of those products to best advantage. The report states that one of the outstanding events of the year was the discovery of Monastral Fast Blue. Its importance may be gauged by the fact that little or no outstanding progress had been made as regards the discovery of new blue pigments since the introduction of Prussian blue in 1704 and of synthetically produced ultramarine in 1826. Extensive research has been conducted on the coal hydrogenation process and its associated problems, such as the manufacture of hydrogen from hydrocarbon gases. As a development of research work in connection with processes already working at Billingham, an apparatus was devised for the elimination of smoke and sulphur fumes from the gases obtained in the ordinary combustion of coal. A considerable amount of research on plastics was carried out in the Billingham laboratories, particularly on new synthetic resins.

### Getting Ready for the Congress

PREPARATIONS for the Chemical Engineering Congress of the World Power Conference, to be held in London next month, are engaging the attention of all the organisations concerned with chemical engineering in this country. About fifty of the principal industrial countries of the world are sending representatives, and the British members are determined to make the Congress worthy of the large attendance that it will attract. The Chemical Engineering Group of the Society of Chemical Industry is making itself jointly responsible with the Institution of Chemical Engineers for the presentation of eleven papers, while representatives of both bodies are co-operating with those of a large number of other organisations in supporting the efforts of the British National Committee to make the week a memorable one. The executive committee of the Chemical Club, 2 Whitehall Court, has decided to extend the privileges of temporary membership to all those who are attending the Congress. The necessary cards for temporary membership, which are available for one month, may be obtained on application to the Secretary of the Club.

### A Chemical Club for Manchester

TRIBUTE has often been paid by the presidents of the principal national chemical organisations to the manner in which the provincial societies have set an example to the parent bodies in the cultivation of close contact with each other. Newcastle, the birthplace of the Society of Chemical Industry and the home of a great many chemical and allied societies, long ago established its own Chemical Industry Club, and Manchester, Glasgow, Birmingham and a few other cities have afforded other instances of the advantages of joint action. Manchester has a chemical societies' joint advisory committee which has repeatedly laid stress upon the importance of joint meetings, and during the session just ended an unprecedented number of such meetings have been held. Its recently issued report, however, states that still further effort is required before complete co-ordination can be achieved. A noteworthy outcome of co-operation at Manchester is the establishment of a Chemical Club on similar lines to that at Newcastle, which is to be housed at the premises of the Manchester Constitutional Club. Although not yet in being, the club is expected to be opened by the commencement of the next session. Not only will it meet a long felt want on the part of the local chemists, but it should make an ideal meeting place for those who frequently visit Manchester in connection with the activities of the many chemical organisations which have local sections in the city.

### New Smokeless Fuel Plant

NEW plant for turning 6,000,000 tons of coal into smokeless fuel, oil and petrol, is to be erected by Low Temperature Carbonisation, Ltd., at a cost of £200,000, near the pits of the Bolsover Colliery, Derbyshire. The new works will consist of 288 retorts, and the necessary subsidiary machinery that the capacity of the by-products oil and petrol recovery plant will be sufficient to deal with the output from 432 retorts.

## Annual Meeting of Imperial Chemical Industries, Ltd.

### Sir Harry McGowan's Hopeful Outlook for 1936

**P**RESIDING at the ninth annual meeting of Imperial Chemical Industries, Ltd., at Queen's Hall, Langham Place, on Monday, Sir Harry McGowan referred to satisfactory increases in trade during the past twelve months, and spoke hopefully of the outlook for the current year.

The new coal hydrogenation petrol plant at Billingham, said Sir Harry, was working satisfactorily, having regard to the magnitude of the enterprise and the unique nature of the process. Every new factory required a certain time to shake down and get into full running order, even where the method of production was familiar. In the case of a novel process, troubles were likely to be more persistent because careful observation must precede each modification. While that was their experience at Billingham, they had encountered no fundamental difficulty, and they would, he thought, shortly reach the full measure of their original expectation.

#### Economic Nationalism

Reviewing the export market, Sir Harry McGowan said economic nationalism was still persistent throughout the world, for not only had it sprung from political conditions, but it would remain so long as political conditions continued to be unsatisfactory. So far as one's vision could pierce the future, there seemed little likelihood of any disappearance of this feature. I.C.I. was, therefore, regrettably forced to follow its tendencies by adopting a policy of entering upon the establishment of local factories, wherever the demand in a country was sufficiently large to make the establishment of an enterprise there economically sound. By this policy they combined manufacture on the spot with some share in the remaining import trade. As the local market grew, imports tended to decrease. In consequence, they gradually faced a reduction of manufacture at home. While this was to be regretted, no alternative presented itself. The smaller nations, as they grew in wealth and ability, could not be expected to refrain from establishing for themselves in their own country such a basic industry as chemical manufacture—valuable for peace purposes, and, at the same time, essential for defence. The products of local manufacture naturally secured a welcome denied to imports. As each of these projects got under way it complicated the company's problems, problems not only of management but of the maintenance of the necessary technical co-operation, in order that, notwithstanding the small scale on which some of these enterprises were commenced, they might not be lacking in knowledge of the latest progress in science and technique.

#### Net Profits

The company's net profits showed a further moderate increase of £357,000. This net income was arrived at after providing £1,000,000 for the central obsolescence and depreciation fund and the necessary amount for the company's income-tax. The board had again appropriated £1,000,000 to the general reserve, and had also this year put aside £150,000 for a workers' pension fund. This left £5,557,000, which, with the £608,000 brought forward from last year, made a total of £6,165,000 available for dividend and carry-forward. The preference dividend, calling for £1,591,000, was paid on the due dates, leaving a balance of £4,574,000.

The board had again found it necessary after their usual annual review of the values of the company's plant and other assets, held through the wholly-owned subsidiary companies, to write off £2,175,000, of which £1,400,000 was taken from the capital reserve, leaving £4,160,000, apart from the sum which arose from the reduction of capital, and £775,000 out of the central obsolescence and depreciation fund, leaving that fund standing at £3,365,000. The free reserve stood at

£6,000,000, and the obsolescence and depreciation reserves in the books of the subsidiary companies at the same date amounted to £3,054,000. The total amount written off the book value of manufacturing and other assets of the wholly-owned subsidiary companies was again heavy. It was spread over a large number of plants, and was to be attributed to the uninterrupted progress of scientific and technical developments. Efficient and modern plants were essential for the preservation of capital values, and the policy of maintaining that position inevitably necessitated writing down any values which fell below the latest standard of knowledge.

#### The Company's Aims

From a perusal of the annual report, with its record of growth in the volume of business, of capital extensions, etc., a larger increase in the company's profits might perhaps have been expected by shareholders. The company endeavoured to combine every possible extension of activities with a consistent care of the prices charged for its products. As a quasi national organisation, serving practically all the major industries of the country, it endeavoured to preserve the shareholders' capital and to make it reasonably remunerative; to provide customers with the finest products and give them also the most attentive service; to keep in the forefront of technical progress by active and original research; to recruit the finest material possible for employees of all grades, and to enlist their loyalty and interest by giving workers and staff the best working conditions, as well as by caring for their physical and mental needs—the co-operation of loyal workers was one of the most valuable assets the company possesses—and to keep prices as low as possible, consistent with the foregoing principles. Low prices in the long run stimulated a greater volume of trade, as their products are the raw material for the great industries of this country. The less they charged the more competitive should their customers become, and every increase in their trade meant a greater volume in that of the company.

Such a policy spelt long-continued success, and was more likely than any other so to build up the strength of the organisation that it would endure through long years to come, able to meet any competition offered to it, and still provide the shareholders with a gilt-edged industrial investment.

#### The Arms Inquiry

Sir Harry referred to the evidence he gave before the Royal Commission on the Private Manufacture of and Trading in Arms. "We did not," he said, "confine ourselves merely to refuting the allegations that the I.C.I. was in the main a munitions producer, but endeavoured to demonstrate how our developments of recent years, purely on a peace-time basis, had provided a national asset which would be invaluable in time of crisis. Examples are to be found in our nitrogen fixation plant at Billingham, and our more recent development of the production of petrol by the hydrogenation of coal. As a further example, many will recall the national difficulties which arose on the outbreak of the great war owing to the absence of a comprehensive and efficient dye-stuffs industry in this country. That deficiency has been made good. In the field of general chemicals, other instances are the production of sulphuric acid, and, in particular, the manufacture of oleum using native calcium sulphate, and also the development of numerous chlorine derivatives. All these products are essential to any country in times of peace, but in times of war they become of supreme importance. There is a body of British opinion, very vocal (but not, I think, very large), which favours the nationalisation of all factories engaged in the production of

munitions. We do not endorse that view. We feel that it is based on an inadequate appreciation of the facts of the case. It is a proposition which could only be carried out at tremendous cost, and even if that drawback is lightly eliminated, as is too often done, it would be economically unsound."

If all munition factories were nationalised, continued Sir Harry, two points with regard to personnel must be borne in mind. First, he did not feel sure that men who for years had experienced commercial conditions and incentives would be willing, except in time of crisis, to accept posts in Government factories. Secondly, a business such as theirs, for example, had a reservoir of men who had been trained in the making of peace-time goods, but who were equally at home with allied war products, and so could, in time of crisis, turn their skill and experience to the production of munitions. This reservoir might not exist if all munition factories were nationalised. The men would have to be either employed on the manufacture of arms, etc., or stand idle.

With regard to the workers' pension fund, Sir Harry McGowan said a sound actuarial pension scheme instituted now would be likely to even-out the total cost of pensions to the company taken over a long period, which was in itself a desirable feature. The pensions would be subject to a contribution from the worker, whereas at present he made none, and it was, of course, essential that most, if not all, of the workers come into the proposed pension scheme. Entry would be made compulsory upon all new workers.

"My views of the future are clouded in one respect," said Sir Harry. "I refer to coal, which in this country

is the basis of power for all the major industries and, in addition, for us is a vital raw material. The problems of its supply and price are therefore of prime national importance. Any substantial increase in the price of coal must affect industrial consumers both directly and indirectly; first, on their own purchases, and, secondly, through the increased prices of all their other goods arising from the additional coal costs of other suppliers. Further, if it is intended to expand exports of coal by lower prices to foreign buyers and to recoup the loss by still higher prices to industrialists at home, our competitive power will be doubly hit, for we shall be paying part of our competitors' costs as well as all our own. I feel sure that a statesmanlike price policy will prevail and that the new powers to be conferred will not blind the mining industry to the necessity of sparing no effort to bring its organisation to a point at which increased labour costs will be largely, if not entirely, absorbed by contra economies."

His estimate last year that 1935 might be looked forward to as a reasonably successful year, with neither any abnormal setback nor any outstanding extension of our manifold activities, had proved correct. He could only hope that 1936 would yield them similar conditions and similar results. At home, their business so far this year was better than last year, and recent employment figures gave every hope of continuing steady progress. Activity in the building industry as a whole was still strong, and while housing construction might fall somewhat in the future, as against this, it was not unlikely that industrial construction would show an increase.

## Oil and Colour Chemists' Association Annual Meeting of Manchester Section

**T**HE Manchester Section of the Oil and Colour Chemists' Association held its twelfth annual meeting at Manchester last week, Mr. V. G. Jolly, Ph.D., F.I.C., presiding. The financial report of the hon. treasurer disclosed a donation of £25 made by the Section to the parent body.

Mr. H. Gosling, hon. secretary, in his report, stated that the present membership of the Section was 107, twelve new members having joined.

Mr. H. Gosling and Mr. Frank Sowerbutts were respectively re-elected hon. secretary and hon. treasurer of the Section for the ensuing year. Dr. Samuels and Dr. H. Mills were elected to fill vacancies in the membership of the committee owing to the retirement of Mr. M. Archer and Mr. H. Clayton. Messrs. L. Bowden and R. Fulton were re-elected auditors.

As the result of an alteration of the rules it was decided that the publications hon. secretary should be elected annually and should be a member of the committee, that office being at present held by Mr. J. G. Vear.

The chairman stated that an effort had been made to arrange for the reading of papers during the forthcoming session which would prove to be of interest to all sections of oil and colour chemists. There would be a presidential address by Dr. New, probably dealing with "Inorganic Pigments," and probably, also, lectures upon the subjects of "Shellac," "New Material for Paint and Oil" (by a gentleman from the Imperial Institute), "Leather Finishes," "The Colouring of Latex," "Modified Copals," "Industrial Solvents," "Reminiscences of the Oil and Colour Chemists' Association," and "Synthetic Resins."

In connection with the opening of the new building of the Paint Research Station, at Teddington, it had been arranged that Dr. Hanstock should deliver a lecture to the members of the Oil and Colour Chemists' Association on Thursday, May 21.

Mr. H. Gosling read the annual report of the Manchester

Chemical Societies' Joint Advisory Committee in which it was stated that the committee had repeatedly laid stress upon the importance of joint meetings being held of the various scientific societies. It was, therefore, with much satisfaction that they recorded an unprecedented number of such meetings during the period 1935-1936, several of the participating societies having co-operated upon every possible occasion. Co-ordination of meetings had been well maintained, but further efforts would have to be expended and a better understanding of individual difficulties reached before complete co-ordination would be achieved.

The register was completely overhauled during the past year, each member of the committee supplying the very necessary lists of new members of his Society and also changes of address. At the beginning of the period covered by this review the register contained a list of 1,727 names. It had again been used by the Advisory Committee for Post-Advanced Instruction in Chemistry for the purpose of mailing their booklet. It has been used, also, by the newly-formed northern branch of the Institution of Petroleum Technologists; and the large attendance of approximately 400 at the inaugural meeting of that branch on February 28 was undoubtedly due in large measure to the publicity which the register afforded.

### A Chemical Club in Manchester

At the close of the 1934-1935 session a proposal was submitted by the committee to the Advisory Committee for Post-Advanced Instruction in Chemistry, suggesting that the representatives of the Manchester Sections of the Institute of Chemistry and the Society of Chemical Industry on that committee should represent also the Manchester Chemical Societies' Joint Advisory Committee. In accepting this proposal the Advisory Committee for Post-Advanced Instruction in Chemistry stated that they would welcome any suggestions which this committee desired to submit for consideration.

The outstanding event had been the elaboration of a scheme for establishing a Chemical Club in Manchester. Tentative proposals were submitted by the committee to the members of the participating societies at the end of September, and the acceptance of those proposals by 150 members indicated that sufficient support would be forthcoming to warrant the

committee entering into negotiations with existing Manchester clubs for the housing of a "Chemical Club." Following these negotiations a meeting of the committee, together with other representatives of the participating societies, was held on February 4, when it was unanimously resolved that a Manchester Chemical Club be established.

## Letters to the Editor

### The Poisons Board

SIR.—I am pleased to see that my letter has provoked the interest of Mr. H. F. T. Rhodes, but I regret that he has neglected the points which really matter. With regard to the protest of the British Association of Chemists, the editor of the "*Chemical Practitioner*" states that it is not solely on account of the exclusion of the Association, but I would remind him of a passage in his journal (Vol. 9, No. 50, p. 9.) which reads:—"Why did they want to be included? Because they were the British Association of Chemists and represented a large body of qualified chemists." This goes on to suggest that no single society should be allowed to have preference.

It would be necessary, however, to examine precisely the capacities of the various societies and be much more specific. Mr. Rhodes must, of course, be the first to admit that membership of certain associations does not demand the highest qualifications and that their chief function is the stimulation of interest and progress in particular fields by lectures, publications, etc. The question of exactitude of qualification is beyond the sphere of most societies.

Mr. Rhodes, in closing, avers that I suggested that the members of the B.A.C. had qualifications which would not bear inspection; to have made such a mistake, I can only imagine that he read my letter with great haste.

I gave an indication of a means of admission to the B.A.C. which is alternative to the possession of academic qualifications. Mr. Rhodes has made this a matter of precision so that we might reasonably dwell on the point for a moment. The rule reads that a sufficient general education and scientific training, together with at least seven years' experience in the practice of pure or applied chemistry with evidence of dependability and initiative are demanded. The case with which suitable references may be obtained is such that we may give it no further attention, the other part engaging our thought.

How is the sufficiency of the scientific training to be determined? Is this assessed by men who, apart from their own qualifications, are of mature experience in teaching and examinational work? And does it not seem to be a matter of great surprise that a candidate for admission should have to confess that while he has gone through an organised course of training, he is unable to show the possession of a recognised diploma of the type available for all who can survive the examination? Do the B.A.C. assessors inquire why a qualification has not been obtained? If the man has applied under this rule, it would seem that the only reason for his not obtaining something respectable is because he was unable to do so. The rule very clearly allows of the inclusion of a man who has been unable to pass his final. Has Mr. Rhodes ever heard of a member of the B.A.C. who has been unable to pass the examination of the Institute of Chemistry? The writer is acquainted with a case.

I mentioned the example of the development of a "chemist." It should be understood that I am well acquainted with such cases, and while I obviously cannot give details with considerable risk, I may pick out that of a man whose sole claim to academic distinction is matriculation. Since this time he has devoted himself to gathering experience in a rather limited section of chemistry, doing this so assiduously as to exclude completely any acquaintance

with other parts of the science. So well has he succeeded in this, and so much has he impressed his superiors with his charm, that he has been rewarded with the title of chemist, and as the law stands, there is no reason why he should not bask in the light which the name may give, even when he has left the bounds of the firm which has the happy knack of conferring in the most lavish manner a title and status which others may get only with a knowledge of chemistry.

The chief point about the whole matter, as I previously stated, is that many chemists are already qualified by the Institute of Chemistry or have qualifications which are acceptable by that body and they, together with those who are already engaged in occupations covered by the proposed registration, need have no qualms. When the accommodating terms of the Poisons Regulations are considered, it is difficult to imagine what the precise complaint is, unless the openings for the semi-qualified are fought for. I should have been glad if Mr. Rhodes had not avoided this essential part of my letter.

Mr. Rhodes asserts the B.A.C. should be included because it is a trade union. This is rather difficult to see: it would seem totally unnecessary, and surely it will be agreed that the Association is well occupied with the various functions of the trade union—questions of the protection of chemists, benefits of one kind or another.

It seems unnecessary to quibble about a point which, after all, will affect no one, and it would be far better if this misdirected energy were used to bring about registration so that chemistry would be for chemists. Chemistry is possibly the only profession which is open to quacks and charlatans and the lack of registration is exploited to the full.

A man may not describe himself as a medical practitioner without holding a diploma of a specified examining body nor may he extract teeth as a dental surgeon without similar equipment: and we are all aware that a man of clerical occupation who poses as a chartered accountant is frowned upon and penalties are imposed. But there is no back door to these professions: there are no societies which say, "We are sorry that you failed in your final or you did not sit for it, but we like you and as you have gone to the trouble of spending so many years connected with the profession we will enrol you as a member and henceforth you will be equal to those who have passed an examination." No! to take medicine as an example, if you have a suitable diploma you are in the profession; if you are without it, you are out.

The B.A.C. would do well to bring about a state of things whereby it would be impossible for a firm to lack professional assistance and jeopardise the health and safety of their workers and the near-by public; a state in which it would be possible to prevent the use of the title "chemist" except by the properly qualified; and one in which a register would be a necessity. Under ideal circumstances it would be possible for the B.A.C. to say, "We are not an examining body; amongst other things, we control the Chemical Register and you must hold a specified diploma to gain admission; there are no 'ifs' or 'but's' and there is no back door." The B.A.C. may be assured that such work is really what is needed, and it is clear that there would be no lack of support. It is a worthy cause.—Yours faithfully,

CONSULTANT.

## Fundamental Aspects of Thixotropy

### Some Useful Facts for the Paint Industry

**T**HE term thixotropy was introduced by Freundlich and Peterfi to describe the isothermal reversible gel/sol/gel transformation which could be induced by shaking, or other mechanical means, and subsequent rest, said Mr. J. Price-Jones when giving a lecture on "Fundamental Aspects of Thixotropy" before a meeting of the Oil and Colour Chemists' Association, held at the London School of Hygiene and Tropical Medicine, London, on April 23. The process was reversible, and, in a truly thixotropic system, could be repeated indefinitely. An appreciable interval of time passed before the sol reverted to the gel condition, and this essential time interval was one of the factors which distinguished thixotropy from the related property of plasticity, characteristic of numerous colloid systems.

#### Quantitative Measurement

The quantitative measurement of thixotropy, however, was in its most rudimentary state and hardly anything was known of the phenomenon except in a qualitative aspect. For instance, it was stated in the literature that "the rate of setting of a thixotropic gel depends on the size of the vessel," but on analysis this statement really meant that the rate of setting to the state where the containing vessel could be inverted depended on the size of the vessel. This statement would naturally be true if the gel set at the same rate in vessels of different radii. His own work, however, had demonstrated that the rate of setting was independent of the radius of the vessel when the experiments were carried out at the same rate of shear corresponding to the size of the vessel. Unfortunately it could also be shown that in certain thixotropic systems the rate of setting was the same even at different rates of shear, and this anomaly arose from the fact that at the low rates of shear necessary for the measurement of thixotropy there exists a "dead space" or an unsheared core of fluid which remained outside the range of the shearing force. That could actually be seen in a thixotropic paint in a Couette apparatus.

Mr. Price-Jones then demonstrated his electromagnetic thixotrometer, which contained a thixotropic dispersion of colloidal clay in water containing a trace of electrolyte. Immediately after stirring the system, the reflected spot of light on the screen indicated that the moving cylinder was swinging freely in a typical liquid, but after the system had been left at rest for 15 seconds, the spot of light remained at rest a long way from its zero position. On gentle stirring, the system reverted to its fluid condition but set again after a few seconds rest. Following a demonstration with the lecturer's improved apparatus for the observation of thixotropy, typical curves were shown indicating the increase in viscosity with the passage of time.

#### Selection of Environment

In a previous lecture to the Association, Mr. Price-Jones had indicated his belief that as the introduction of the concept of the "colloidal state" was more significant than the original idea of a "colloid" as enunciated by Graham, so it would be more accurate to assume that a very large number of compounds could be obtained in the thixotropic state by the appropriate selection of the environment. As thixotropy, according to this idea, depended on the degree of dispersion of the particles, the property should gradually disappear at the dispersing power of the medium was increased. A system consisting of five parts of stand oil (heated at 275° C. for eight hours), 35 parts of raw linseed oil, and 50 parts TiO<sub>2</sub>, was highly thixotropic and the change in viscosity was obvious after the system had been resting for one minute. A system of the same proportions, but in which the same oil had been heated for 30 hours, was entirely free from thixotropy even

after one hour's rest. Similarly, in a system consisting of 13 per cent. vacuum distilled stand oil and raw linseed oil made into a paint with an equal weight of TiO<sub>2</sub>, gave marked evidence of thixotropy in less than one minute, whereas if the same proportion of the same stand oil was increased to 15 per cent., the system was entirely free from thixotropy. This latter experiment showed that thixotropy was determined by very small variations in the composition of the environment, and it was explained that a difference as small as one per cent. in the free acid content of a medium could change a fluid paint into a highly thixotropic condition.

Assuming, therefore, that the degree of thixotropy is proportional to the dispersing power of the medium, the lecturer inquired into the dispersing powers of various media and showed by a series of curves how thixotropy can be induced in a system—60 parts of boiled oil, 40 parts of titanium white—which is not normally thixotropic. He pointed out that thixotropy could be produced by replacing a part of the polymerised oil by raw oil, as the latter possesses no dispersing power. Similarly, thixotropy could be imparted to this system by the addition of metallic soaps such as zinc naphthenate, aluminium stearate or zinc oleate.

Mr. Price-Jones explained the differences in the two entirely different types of paint which he characterised in his previous lecture as thixotropic and false-bodies paints. He said a typical thixotropic paint is represented by a system such as 30 per cent. boiled oil and 70 per cent. TiO<sub>2</sub>, whereas a system composed of 60 per cent. boiled oil, 30 per cent. TiO<sub>2</sub>, and 1 per cent. zinc oleate would be "false-bodied." The thixotrometer showed that in the former type there would be very little increase of viscosity in the first five minutes, but it became appreciable in 25 minutes or more. On the other hand, the latter type gave a marked increase of viscosity in one minute, or less, and after five minutes the rate of increase gradually died away. Although these two types appeared to be distinct, it was possible, it was said, to obtain thixotropic systems which showed a gradation from one extreme type to the other, and the belief was expressed that the extreme types actually represent two entirely different colloidal regimes.

#### False-Bodied Paints

In discussing two typical examples of thixotropic and false-bodied paints, it was shown that the latter possessed marked elastic recoil—as shown in the thixotrometer—immediately after stirring, and that all its properties were those of an elastic fluid. After the paint had rested for five minutes or more the elastic recoil was much more pronounced, and in some paints persisted for periods of 20 minutes or more. On the other hand, the thixotropic paint had no recoil after stirring, but developed the property after resting five minutes although even in this state it was of very brief duration. The thixotropic paint gave a curve which was practically logarithmic after stirring, whereas false-bodied paint gave a curve indicating very low viscosity at high rates of shear, but became almost infinite at very low rates of shear.

A demonstration was given of elastic recoil in a system composed of 30 parts of colloidal clay and 100 parts of water. In this state the system was almost a true Newtonian fluid; there was no thixotropy and no elasticity, but on the gradual addition of traces of electrolyte, the two properties gradually became apparent. It was shown that such a system was really false-bodied and was characteristic of all the systems which formed the classical examples of thixotropy as investigated by Freundlich and others. The same effect was obtained with bentonite gels. In each case thixotropy and elastic recoil were entirely destroyed by the addition of sodium in small quantities.

It was put forward that the two types of thixotropy in paints correspond to a dispersing and a precipitating environment and it was suggested that a very close analogy can be drawn between a bentonite gel and a false-bodied paint. If it be assumed that raw linseed oil has no dispersing powers and that a pigment such at  $TiO_2$  is completely flocculated in this medium, and that a low concentration such as 30 per cent., it is completely dispersed in a polymerised oil, the following comparison could be drawn up:—

1.5% Bentonite.	30% Titanium oxide.	Properties.
P. In water . . . . .	In raw linseed oil.	Elasticity.
		False body.
Q. In 0.5% $Na_2SiO_3$	In polymerised oil.	No elasticity.
R. In Q plus 1% $CaC_2$	In polymerised oil and 1% zinc oleate.	No false body.

If the concentration of  $TiO_2$  was increased to 60 per cent., then P and R gave an increase in false body, but Q gave thixotropy.

THE PRESIDENT, who proposed a vote of thanks to the lecturer, which was heartily accorded, said that although the lecturer had been discussing thixotropy and not paint manufacture, there was a great deal of useful matter in the lecture for the paint industry. The discussion of the borderline between a thixotropic and a false-bodied material, the discussion of the methods of passing from one to the other with and without the agency of a soap or soap-like substance and the discussion of the change of environment from a peptising to a precipitating environment were all food for thought and not at all in a remote and academic way.

## The Chemical Engineering Group

### Annual General Meeting and Dinner

THE annual general meeting and dinner of the Chemical Engineering Group was held at the Waldorf Hotel, London, on April 24. Mr. Stanley Robson, chairman of the Group, presided at both functions.

Mr. JULIAN M. LEONARD, hon. secretary, presented the report of the committee, in which he pointed out that the progress which had been made to promote the welfare of the Group and the service which it desired to render to its members promised a good augury for the future, and with the continued improvement in the country's trade, the Group should go from strength to strength. The growth in membership, although small at present, was accelerating and had increased from a net gain in the previous year to 17 in the past year. The membership now stood at 455, and it was hoped greatly to augment this in 1936. After referring to the fact that the Group and the Institution of Chemical Engineers were jointly sponsoring eleven papers to be read before the Chemical Engineering Congress in June, and to a number of more or less domestic matters relating to the management of the Group, Mr. Leonard said the most important matter which the committee had to investigate during the year had been the consideration of the composition of the Group. It was felt in some quarters that, generally speaking, the Group was not making the continued progress which the importance of its position justified, and that it had developed a sense of static quietude and self-satisfaction. As a result of many discussions, an outline of a scheme of reconstruction and reorganisation was agreed upon. Mr. Leonard concluded with an expression of the appreciation of the committee of the loyal services which the assistant secretary, Mr. C. J. T. Mackie and his staff had given during the year.

Mr. F. A. GREENE, hon. treasurer, in presenting the accounts, said he did not regard them as unsatisfactory, and emphasised the point that the Group was not a savings bank. After deducting the deficit for the year there was still a balance in hand.

#### Election of Officers

The result of the elections of officers and members of Council was the re-election of Mr. Stanley Robson, chairman; Mr. Julian M. Leonard, hon. secretary; and Mr. F. A. Greene, hon. treasurer; and the election of the Messrs. W. A. S. Calder, J. Arthur Reavell, W. E. Spiers and B. H. Wright to fill vacancies on the general committee.

A cordial vote of thanks was passed to the officers for their services during the year.

The usual practice was followed at the annual dinner of having an address as the main feature, although there were also two short toasts. The speaker was Lord Amulree, who

has been Secretary of State for Air and president of the Air Council, and he took as his subject "Aviation."

Lord AMULREE discussed first the airship, then the machine to penetrate the stratosphere, and finally the aeroplane and civil aviation. He related the history of the airship in this country and the circumstances in which developments in connection with it were abandoned. Speaking of the stratosphere, he regretted that our share in contributing to the penetration of the stratosphere would, for the present, be nil, and in this connection he mentioned how the late Lord Haldane was satisfied that the study of the stratosphere could be done effectively, and that England should do it.

#### Commercial Aviation

Lord Amulree spoke in terms of high praise of the manner in which our Air Ministry had assisted in building up a remarkable system of commercial aviation, notwithstanding that last year the subsidy of Imperial Airways was a little more than one-third of that enjoyed by the French and two-thirds that paid to Italians. The Air Navigation Bill now before Parliament, it was pointed out, empowers the Secretary of State to enter into long-term agreements for subsidies to a limit of £1,500,000 over a period ending December 31, 1953. The present limit is £1,000,000. After the somewhat bitter comment that it is only in England that Imperial Airways is criticised, and that its prestige abroad is very high, Lord Amulree said that the principles upon which our air services were being developed were now being adopted by all other countries in the world.

Sir ALEXANDER GIBB proposed the toast of "The Society of Chemical Industry," and coupled it with the name of the president of the society.

Mr. W. A. S. CALDER, in reply, spoke of the pride of the society in the Group—as in all its groups—and added that whether there would still have been a Society of Chemical Industry if there had not been a Chemical Engineering Group he left the members of that Group to decide.

Major H. J. W. BLISS proposed the toast of "Our Guests."

Mr. W. R. BARCLAY, president of the Institute of Metals, who responded, spoke of the relationship between metallurgy, which he represented, and all branches of engineering, and commented how, on the one hand, the metallurgist had provided new materials for the chemical engineer who, on the other, had shown such great ability in making use of them. At the same time he expressed the view that chemical engineers and metallurgists are not in such close contact as they should be, although he regarded metallurgy as being really a branch of chemical engineering, probably due to the different "jargon" of which they each made use and made it difficult to understand each other.

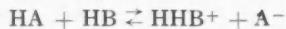
# The Chemical Union of Acids with One Another

## An Investigation at the Royal Technical College, Glasgow

**T**HE possibility of two acids uniting to form an anion analogous to the oxonium ion is discussed, and an explanation of why such a union results in a decrease in specific conductivity, simultaneously with a decrease in  $\rho H$  value is suggested, in an article which is published in the "Journal of the Royal Technical College, Glasgow" (January, 1936, No. 4, 569). Evidence that  $H_3PO_4$  will accept protons from HCl is furnished from the behaviour of a mixture of the pure acids.

According to the joint authors, J.A. Cranston, D.Sc., F.I.C., and H. F. Brown, B.Sc., A.R.T.C., the usual conception of acids and bases has been enlarged somewhat by defining an acid as any substance which is a source of hydrogen ions, and a base as any substance which can accept hydrogen ions. Thus the  $H_2SO_4$  ion can act both as an acid and a base, because it may yield hydrogen ions to form the sulphate anion, and it may accept hydrogen ions to form sulphuric acid. In a similar way, all anions may be considered to be bases if they combine with hydrogen ions to form acids. The enlargement of the definition of a base, as a reasonable method of classifying substances, and correlating their properties, becomes particularly interesting when it is seen to apply to substances which are normally considered as acids.

The electronic theories of valency suggest that combination may sometimes occur between two acids themselves, by a transfer of a proton from the stronger to the weaker acid. This should result in the formation of a salt-like compound, where the weaker acid plus a proton behaves as the cation, and the anion of the stronger acid as the anion. Thus :—

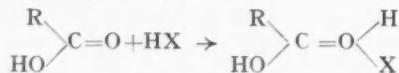


where HA is stronger than HB. According to definition, therefore, the weaker acid is a base by virtue of its acceptance of a proton.

It is hardly to be expected that compounds between acids will be stable enough to be isolated in the pure state, and their properties investigated. Evidence of their existence in loose combination will, therefore, be sought for from departures from the law of mixtures, when the physical properties of mixed solutions are investigated.

It has been shown, for example, that the solubility of many weak acids is increased by the addition of concentrated solutions of ortho-phosphoric acid,  $H_3PO_4$ , and this has been explained by compound formation.<sup>1</sup> This, however, is not the only explanation that can be put forward for the increase in solubility, because it is shown by the theory of Debye and Hückel that the ionic atmosphere, produced by the addition of any electrolyte, tends to increase the solubility of the electrolyte originally present. Hence, solubility measurements do not furnish decisive criteria of compound formation.

Anomalous freezing point determinations, obtained with mixtures of phosphoric acid and weak organic acids, have also been explained by compound formation.<sup>2</sup> For weak acids containing oxygen, e.g., oxalic acid, combination is usually explained as due to formation of an oxonium salt in which oxygen becomes quadrivalent :—



The mechanism of combination, however, which the present authors wish to emphasise, is that whereby the proton from a stronger acid attaches itself to the undissociated molecule of a weaker acid. This could occur theoretically, whenever the

weaker acid has a lone pair of electrons, which could be shared with the hydrogen ion of the stronger acid. Whether or not this union occurs in practice will depend on the chemical nature of the molecule acting as proton acceptor. Thus the anions  $ClO_4^-$ ,  $SO_4^{2-}$ , and  $PO_4^{3-}$  have similar atomic and electronic configurations, but show very different affinities for protons, and this is not completely accounted for by the differences of charge which they carry. Indication of the differences in proton affinities may readily be obtained by comparing the similarly charged anions  $ClO_4^-$ ,  $HSO_4^-$  and  $H_3PO_4^-$  by means of the dissociation "constants" of the corresponding acids. There is a marked decrease in strength in the order  $HClO_4$ ,  $H_2SO_4$ , and  $H_3PO_4$ . One would expect little or no proton affinity from the first of these—incidentally, no acid appreciably stronger than perchloric acid is available for supplying protons to it—but it is conceivable that a strong acid such as hydrochloric acid, may supply protons to phosphoric acid  $H_3PO_4$ . One reason favouring such a union would be the high degree of symmetry of the resulting cation  $P(OH)_4^+$ .

The problem arises as to methods of detecting combination between hydrochloric and phosphoric acids should it occur. Data exists on the conductivities of mixtures of hydrochloric and phosphoric acids at various concentrations<sup>3</sup>, and so it seemed advisable to measure electrometrically the  $\rho H$  values of these solutions, and discover what general principles could be drawn from both observations. It was decided also to attempt the direct preparation of a compound by passing dry hydrochloric acid gas through pure phosphoric acid.

### Experimental Work

In their experimental work the authors measured the  $\rho H$  values of solutions consisting of (a) HCl of fixed concentration (*viz.*, 0.25M, 1M, 2M and 3M respectively) in the presence of varying amounts of  $H_3PO_4$ ; and (b) solutions of  $H_3PO_4$  of fixed concentration (*viz.*, 1M) in the presence of varying amounts of HCl. Values were also obtained for  $H_2SO_4$  and for  $HClO_4$  in place of  $H_3PO_4$  in the above scheme. It will be observed that, in preparing these solutions, one acid was not merely added to the other, but was substituted for an equal volume of the water present, the concentration of this latter acid remaining unchanged by this process.

The  $\rho H$  values were measured with the quinhydrone electrode—N/10 calomel electrode combination, all usual precautions being taken. Extrapolation of the usual formula for the quinhydrone electrode to give  $\rho H$  values less than 0 may not give absolute values correctly, but those obtained will at least serve to show the relative values, and this is all that is desired. A selection of the results is graphed (Figs. 1, 2 and 3), from which it will be seen that substitution of  $H_3PO_4$  (or  $H_2SO_4$  or  $HClO_4$ ) in place of water in HCl solution always yields solutions of higher hydron concentration (*i.e.*, of lower  $\rho H$ ), but the more concentrated the HCl solution, the less the increase in hydron concentration, as the amount of  $H_3PO_4$  (or  $H_2SO_4$  or  $HClO_4$ ) is increased (Figs. 1, 2, 3). This effect is most apparent with  $H_3PO_4$  and least with  $HClO_4$ ,  $H_2SO_4$  occupying an intermediate position as is perhaps to be expected from the order of the dissociation "constants" of these three substituting acids. To illustrate this point, it will be seen that while the effect of  $H_3PO_4$  on 0.25N HCl is appreciable, its effect on 3N HCl is negligible (Fig. 1).

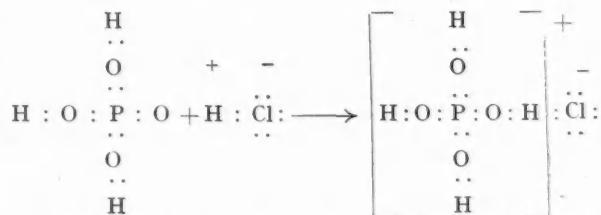
The complete suppression of ionisation of the weak acid  $H_3PO_4$  may explain this effect in presence of the more concentrated HCl solution, but such an explanation is shown to be insufficient to account for the behaviour of the conductivities of identical mixtures. We find that the specific

<sup>1</sup> Walton and Stark, "J. Phys. Chem." 1930, **34**, 543-8; Kendall and Andrews, "J. Amer. Chem. Soc." 1921, **43**, 1545; Knox and Richards, "Chem. Soc." 1919, **115**, 508.

<sup>2</sup> Walton and Kepper, "J. Phys. Chem." 1931, **35**, 1745; Kendall, "J. Amer. Chem. Soc." 1914, **36**, 1722.

<sup>3</sup> Cranston and Bell, "J. Royal Tech. Coll., Glasgow," 1926, No. 3, 36; Cranston and Duncan, *Ibid.*, 1927, No. 4, 41.

conductivity of hydrochloric acid solutions stronger than normal falls when some of the water present is replaced by phosphoric acid, whereas for solutions of hydrochloric acid weaker than normal the presence of phosphoric acid increases the conductivity. The rapid fall in specific conductivity of solutions, twice normal and thrice normal with respect to hydrochloric acid solutions, as the concentration of phosphoric acid increases, points to a decrease in the number of ions present a decrease we should expect to result in a corresponding increase in  $\rho H$  (*i.e.*, decrease in hydron concentra-



This scheme pictures a lone pair of electrons, in the fourth oxygen atom of the undissociated phosphoric acid molecule, forming a co-ordinate bond with a proton from hydrochloric acid. The large cation, of single positive charge, in the resulting complex, would favour electrovalency, according to Fajans' rule, and so the complex, if formed, should be stable.

The formation of such a compound would cause a fall in specific conductivity, due to

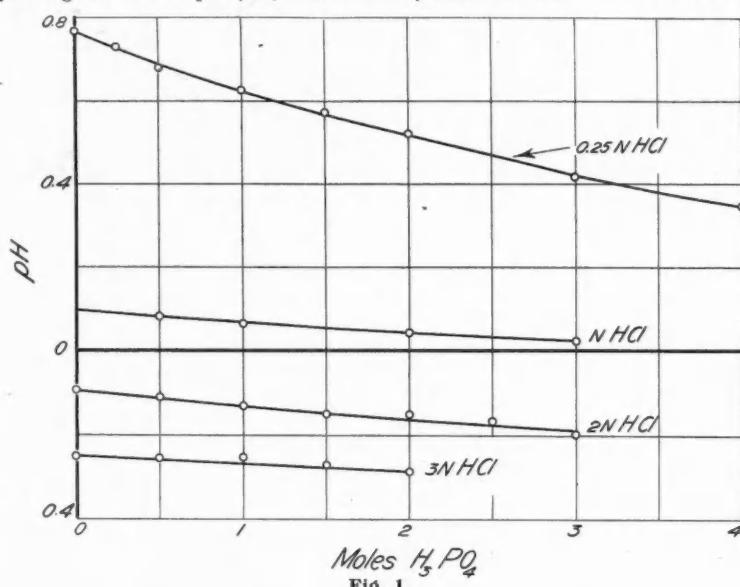


Fig. 1.

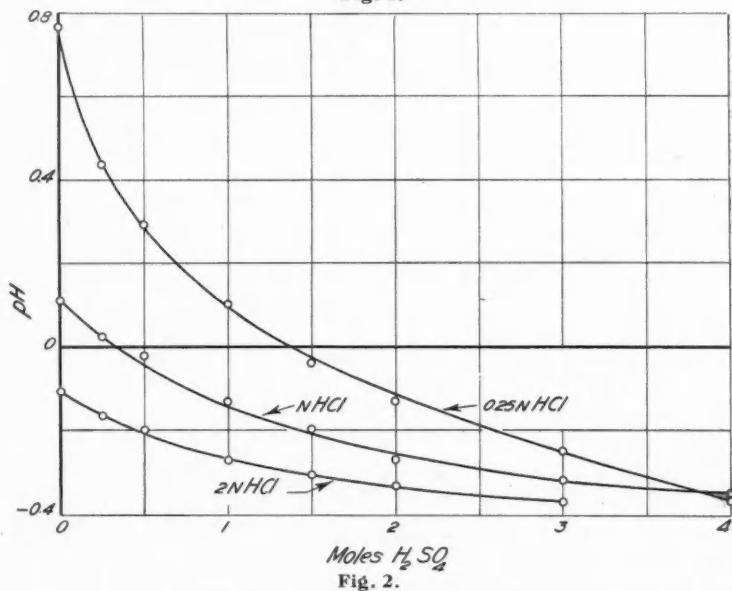
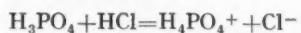


Fig. 2.

tion). Actually, as is seen from the graph, a slight decrease in  $\rho H$  value results. Thus conductivity and  $\rho H$  results are apparently not in agreement.

This anomaly can be explained if all the protons yielded by the hydrochloric acid are not accepted by the water molecules to form the usual "oxonium ion"  $\text{H}_3\text{O}^+$ , but if some of these protons are accepted by the undissociated phosphoric acid molecule, to form the ion  $\text{H}_4\text{PO}_4^+$ , a salt-like compound would thus be formed in solution:—



The increase in symmetry is shown when the above equation is written electronically:—

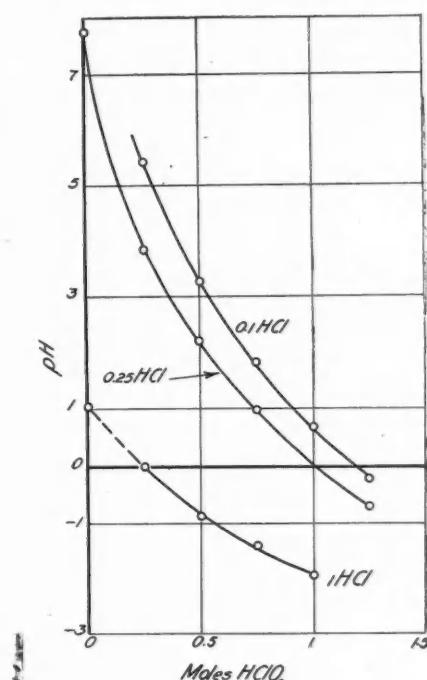


Fig. 3.

the decreased mobility of the  $\text{H}_4\text{PO}_4^+$  ion compared with the  $\text{H}_3\text{O}^+$  ion, but might well cause a rise in hydron concentration as measured by an electrode, providing the electrode responds to  $\text{H}_4\text{PO}_4^+$  ions as readily as it does normally to  $\text{H}_3\text{O}^+$  ions. The authors see no reason why this should not be the case.

#### Preparation of Compound $\text{H}_4\text{PO}_4\text{Cl}$

An attempt was made to prepare the compound  $(\text{H}_4\text{PO}_4)\text{Cl}$ . Pure dry  $\text{H}_3\text{PO}_4$  was heated until it just melted at about  $40^\circ\text{C}$ .), and dry  $\text{HCl}$  gas was bubbled through the liquid. The volume of the liquid increased a little. During the passing of the  $\text{HCl}$ , the temperature of the  $\text{H}_3\text{PO}_4$  was kept as low as was consistent with its remaining liquid. The maximum increase in weight in various repetitions of this experiment was found to be over 8 per cent. For complete conversion of  $\text{H}_3\text{PO}_4$  into  $(\text{H}_4\text{PO}_4)\text{Cl}$ , the increase would be about 37 per cent., so that apparently about one-quarter of the acid had been converted.

The compound, however, is unstable, and immediately, though slowly, evolves  $\text{HCl}$  gas. An attempt was made to measure the dissociation pressure of the compound at room

temperature. A glass vessel containing the compound was sealed to a long manometer tube. The pressure developed in about a week was 4.2 atmospheres, and was still rising. It was observed latterly that the pressure increased more rapidly during the night when the temperature was lower, and not at all, or even decreased, during the day when the laboratory became warmer. Simultaneously, the liquid in the vessel was seen to be crystallising out. Subsequent analysis of the liquid, standing open to the atmosphere for a fortnight, showed that the HCl content had been reduced to 0.5 per cent. by weight.

Attempts were also made to measure the pressure of HCl evolved using a small closed end manometer, in which pressure change in the flask was registered by change in volume of an enclosed volume of air. Successive small amounts of the gas were released after the pressure had become constant at about 2.5 atmospheres, but the resulting equilibrium pressure was always less than the previous reading. Had it been possible to attain a definite value for this pressure, irrespective of the HCl present (within limits), it would have been evidence of the presence of a compound.

#### Manometer Observations

The compact form of manometer facilitated the observation of the previously noted effect of temperature of the mixture on the pressure of the gas above it. Raising the temperature of the contents of the flask from 15° C. to 40° C. caused the pressure to decrease from 2.5 down to 1.5 atmospheres. On cooling the flask the 2.5 atmospheres pressure was re-established. It is evident that the instability of the compound is, at least in part, due to the tendency of pure  $H_3PO_4$  to crystallise out.

In summarising their work the authors state that the proton-accepting acid need not be a particularly weak one, provided that there are other reasons, such as symmetry of the molecule, to favour the "complex" ion. An apparent discrepancy whereby the pH of an acid solution can be decreased simultaneously with decrease in its specific conductivity, is explained by the assumption that the hydrogen electrode responds in aqueous solution to any ions in which protons are loosely held, and not only to oxonium ions  $H_3O^+$ . Dry gaseous hydrochloric acid is absorbed by pure phosphoric acid to the extent of 8 per cent. by weight. The subsequent behaviour of the solution is in accordance with the view that a compound  $H_4PO_4\cdot HCl$  soluble in  $H_3PO_4$  is initially formed, and subsequently slowly decomposes with evolution of HCl, as the  $H_3PO_4$  crystallises out at room temperature.

### Researches on Lubrication

#### Two Distinct States Recognised

A JOINT meeting of the North-Western Section of the Institute of Fuel and the Northern Branch of the Institution of Petroleum Technologists was held at the Engineers' Club, Manchester, on April 22, when Mr. J. E. Southcombe, M.Sc., gave an address on "Recent Researches on Lubrication." Major V. F. Gloag presided.

The lecturer stated that two distinct states of lubrication are now recognised, namely, fluid film and boundary. Lubrication in the boundary state occurs when the film has become so thin that the moving parts are no longer completely separated by a liquid layer. The relationship of friction to chemical constitution in the boundary state and the application of modern theory to certain aspects of practical lubrication were discussed, and the author described recent experimental work which had been carried out by the Air Ministry on the behaviour of lubricants at high temperatures, also his own work on the change of friction with temperature in various families of oils. Finally, he dealt with the effect of polar bodies on friction and the theory of the "Germ" patents. Experimental apparatus for measuring the friction of rubbing surfaces in the boundary state was exhibited, and recent work on lubrication under conditions of extreme pressure was illustrated.

### The Paint Research Station.

#### Complete May Week Programme

MR. J. RAMSAY MACDONALD, Lord President of the Council, has promised to open the new extension at the Paint Research Station at Teddington on May 19. A special programme of visits and meetings has been arranged in connection with the ceremony, the time table being as follows:

*Tuesday, May 19: 2.45 p.m.—Opening by the Lord President; 5.0 p.m.—address by Dr. J. J. Fox, O.B.E., Government chemist designate.*

*Wednesday, May 20: 2.30 p.m.—Visit of the National Federation of Master Painters, London Association of Master Decorators, Incorporated Institute of British Decorators, and Royal Institute of British Architects; 5.0 p.m.—discussion opened by Mr. A. Andrews and Mr. A. E. Munby, who will talk on "Painters' Problems" and "Architects' Painting Problems" respectively.*

*Thursday, May 21: 2.30 p.m.—Visit of the Oil and Colour Chemists' Association; 5.0 p.m.—lecture by Dr. R. F. Hanstock on "The Opacity of Paints."*

*Friday, May 22: 2.30 p.m.—Visit of the Society of Chemical Industry, London Section, and the Plastics Group; 4.30 p.m.—annual general meeting of the Plastics Group; 5.0 p.m.—address by Dr. R. H. Kienle on "Structural Chemistry of Polymers and their Films."*

*Saturday, May 23: 2.30 p.m.—Visit of the Institute of Builders.*

### British Standard Solvents

#### Two New Specifications

Two further British Standard Specifications for solvents have just been issued by the British Standard Institution. These specifications deal with carbon disulphide and ethyl lactate, and are the last in the series of nationally agreed standards for solvents which have been prepared by a technical committee of the Chemical Division of the British Standards Institution, which committee has been actively working for the last three years under the chairmanship of Dr. J. Vargas Eyre, of the Distillers' Company.

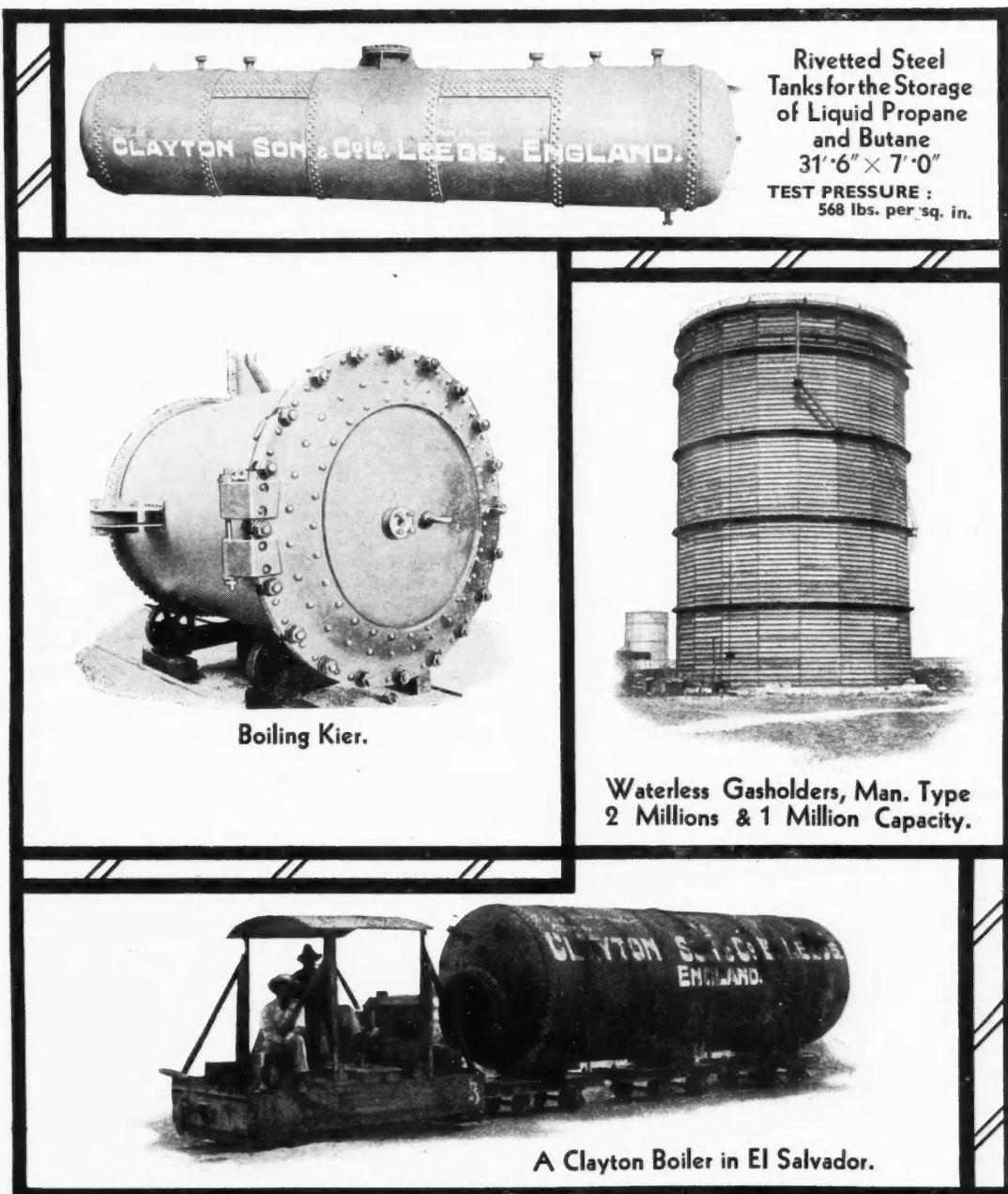
Limits are laid down in the specifications for specific gravity, distillation, acidity, alkalinity, etc., whilst standard methods of test for determining these properties are included in appendices. The details of the tests adopted have been arrived at after careful examination of existing methods of analysis, particularly from the standpoint of accuracy and reliability, and in many cases experimental work has been carried out by members of the committee in practical verification of the methods. The limits specified have been fixed by agreement between the principal users and manufacturers.

The specifications for solvents issued previously by the Institution provide for acetone, ethyl, methyl and butyl alcohols, diacetone alcohol and amyl, butyl and ethyl acetates, dibutyl phthalate, diethyl phthalate, carbon tetrachloride, glacial acetic, dilute acetic and technical acetic acids, hexachlorethane, technical ether and trichlorethylene. Copies of the two new specifications, Carbon Disulphide (No. 662-1936), Ethyl Lactate (No. 663-1936), and all those previously issued may be obtained from the Publications Department, British Standards Institution, 28 Victoria Street, London, S.W.1, price 2s. 2d. each, post free.

SALES of the German potash syndicate in 1935 attained a new all-time peak of 1,320,000 metric tons  $K_2O$  compared with a depression low of 847,000 tons in 1932. The 1935 trade showed a gain of 8 per cent. over 1934, following a previous increase of 30 per cent. over 1933. Both domestic and foreign sales contributed in about equal ratio to the total turnover increase, domestic deliveries rising 8 per cent. to 920,000 tons  $K_2O$ , and thus for the first time surpassing the 1928 peak of 870,000 tons.

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## British Overseas Chemical Trade in March

According to the Board of Trade returns for the month ended March 31, 1936, exports of chemicals, drugs, dyes and colours were valued at £1,789,218, as compared with £1,840,574, a decrease of £51,356. Imports were valued at £1,148,600, as compared with £943,997. Re-exports were valued at £38,561.

	Quantities. March 31, 1935.		Value. March 31, 1935. £		Quantities. March 31, 1936.		Value. March 31, 1936. £	
<b>Imports</b>								
Acids—								
Acetic .. . cwt.	16,292	16,477	24,730	21,981	Drugs, medicines and medi-			
Boric (boracic) .. .	3,441	3,100	3,258	3,099	cinal preparations—			
Citric .. .	1,265	3,299	5,117	11,925	Manufactured or pre-			
Tartaric .. .	2,775	3,958	11,768	16,080	pared—			
All other sorts .. . value				8,534	Quinine and quinine			
Borax .. . cwt.	19,700	11,403	9,881	9,149	salts .. . oz.	120,560	182,146	10,006 14,378
Calcium carbide .. .	91,578	117,135	52,576	62,491	Medicinal oils .. . cwt.	3,702	2,743	12,755 9,449
Fertilisers, manufactured—					Proprietary medicines			
Superphosphate of lime					value			
tons	9,048	7,892	18,882	15,434	All other sorts .. .	—	—	44,830 44,546
All other descriptions ..	2,816	4,518	14,611	24,071	Dyes and dyestuffs and			25,454 56,342
Phosphorus .. . cwt.	1	—	5	—	extracts for tanning—			
Potassium compounds—					Finished dyestuffs (coal			
Caustic and lyes cwt.	7,366	10,718	8,891	11,923	tar) .. . cwt.	3,573	3,605	101,863 111,910
Chloride (muriate) .. .	54,164	55,502	16,191	17,450	Extracts for dyeing .. .	5,299	4,601	11,101 8,938
Kainite and other mineral potassium fertiliser salts .. . cwt.	291,471	210,935	41,149	27,350	Chestnut .. .	26,797	22,356	18,236 15,124
Nitrate (saltpetre) .. .	14,263	40,539	11,414	14,548	Quebracho .. .	23,372	37,152	14,390 31,789
Sulphate .. .	46,189	27,690	16,144	11,352	All other sorts .. .	64,899	29,272	44,721 22,543
All other compounds .. .	8,494	13,811	14,024	19,263	All other dyes and dyestuffs .. . cwt.	1,067	1,165	24,227 21,933
Sodium compounds—					Painters' and printers' colours and materials—			
Carbonate, including crystals, ash and bicarbonate .. . cwt.	7,119	177	2,316	232	White lead (basic carbonate) .. . cwt.	6,592	7,227	7,466 9,254
Chromate and bichromate .. . cwt.	1,648	1,700	2,286	2,353	Lithopone .. .	16,287	20,966	11,261 13,342
Cyanide .. .	1,004	5,559	2,442	13,943	Ochres and earth colours .. .	30,494	38,947	9,404 21,940
Nitrate .. .	43,212	119,000	10,483	33,199	Bronze powders .. .	1,670	1,837	11,370 11,212
All other compounds .. .	16,112	15,372	12,753	17,634	Carbon blacks .. .	18,121	35,838	29,126 52,403
Other chemical manufacturers .. . value	—	—	242,208	321,014	Other pigments and extenders, dry .. . cwt.	22,398	32,406	7,128 8,618
Total .. . value	—	—	—	—	All other descriptions .. .	17,689	15,363	30,996 33,285
<b>Exports</b>								
Acids—					Total .. . value	—	—	943,997 1,148,600
Citric .. . cwt.	1,884	2,364	7,344	9,961	All other sorts .. .	58,398	60,584	64,483 88,212
All other sorts .. . value	—	—	19,565	21,023	Zinc oxide .. . tons	1,333	856	23,079 15,692
Aluminium compounds tons	953	2,722	7,428	35,363	All other descriptions value	—	—	200,188 234,733
Ammonium compounds—					Drugs and medicinal preparations—			
Sulphate .. . tons	30,042	10,758	183,015	63,781	Quinine and quinine salts .. . oz.	251,423	93,463	25,627 11,113
All other sorts .. . "	1,906	1,472	19,324	15,837	Proprietary medicines			
Bleaching powder (chloride of lime) .. . cwt.	36,239	41,322	10,416	11,319	value	—	—	108,791 130,094
Coal tar products—					All other descriptions .. .	—	—	143,052 126,280
Cresylic acid .. . gal.	113,091	251,447	9,531	25,342	Dyes and dyestuffs and extracts for tanning—			
Tar oil, creosote oil, etc. gal.	586,974	2,465,766	15,938	56,064	Finished dyestuffs (coal tar)—			
All other sorts .. . value	—	—	13,940	20,564	Alizarine, alizarine red and indigo (synthetic)			
Copper, sulphate of tons	9,164	5,904	124,016	85,318	cwt.	1,581	2,243	8,163 15,538
Disinfectants, insecticides, etc. .. . cwt.	33,598	27,018	73,049	60,750	Other sorts .. .	6,466	7,016	89,232 90,465
Fertilisers, manufactured tons	10,870	18,920	46,588	61,367	All other descriptions .. .	25,445	21,957	28,758 22,967
Glycerine .. . cwt.	14,549	13,855	34,427	32,747	Painters' and printers' colours—			
Lead compounds .. .	15,885	13,580	18,105	18,021	Ochres and earth colours .. .	16,621	13,151	18,871 13,894
Magnesium compounds tons	392	498	9,245	11,544	Other pigments and extenders, dry .. . cwt.	17,837	26,231	29,293 31,534
Potassium compounds cwt.	4,192	5,493	5,999	10,071	White lead .. .	5,373	6,144	9,875 12,702
Salt (sodium chloride) tons	21,740	17,535	60,700	44,600	Paints and painters' enamels, prepared .. . cwt.	35,967	35,640	93,429 95,505
Sodium compounds—					Varnish and lacquer (clear) .. . gal.	75,304	73,472	29,163 28,201
Carbonate, including crystals, ash and bicarbonate .. . cwt.	405,852	400,030	98,515	93,550	Printers' ink .. . cwt.	4,465	4,173	27,120 25,497
Caustic .. . "	219,215	179,896	116,718	82,466	All other descriptions .. .	30,896	38,135	61,913 78,353
Nitrate .. . "	1,169	13,026	485	4,240	Total .. . value	—	—	1,840,574 1,789,218
Sulphate, including salt-cake .. . cwt.	14,143	46,890	1,589	4,510	Re-Exports			
Chemical manufactures and products .. . value	—	—	18,273	27,831	Dyes and dyestuffs and extracts for tanning .. . cwt.	636	1,608	2,465 1,976
Drugs and medicinal preparations—					Painters' and printers' colours and materials .. . cwt.	316	250	684 960
Manufactured or prepared .. . value	—	—	9,515	.794	Total .. . value	—	—	30,937 38,561

## Continental Chemical Notes

### **Poland**

MANUFACTURE OF ZINC OLEATE AND AMMONIUM OLEATE was started in the past year by the "Strem" Chemical Works, Warsaw.

### **Spain**

LIGNITE LIQUEFACTION PLANTS are being constructed at Aliagn (Teruel) and Flix (Tarragona), reports "Chemische Industrie," April 18.

### **Lithuania**

ACCORDING TO A COPENHAGEN REPORT a technical representative of the Danish concern, Nordisk Insulinlaboratorium, is now considering the question of establishing a sister concern in Lithuania.

### **Switzerland**

PROFITS OF THE SOCIETY OF CHEMICAL INDUSTRY, BASLE, were maintained last year at 3.21 million francs, and the dividend on the 20 million francs of share capital is unchanged at 15 per cent. Export difficulties have compelled the concern to intensify its policy of transferring production to its foreign factories.

### **Czechoslovakia**

THE EXPLOSION CONCERN of Czechoslovakia (explosives manufacturers) achieved a net profit of 12.9 million crowns in the past year, and again distributes a dividend of 10 per cent. on the 60 million crowns of share capital. The Synthesia Chemische Werke A.G. of Prague (owned by Explosia) announces a profit of 5.1 million crowns, and the dividend on the 30 million crowns of share capital is likewise 10 per cent.

### **Russia**

A NEW IODINE FACTORY has commenced production near Baku.

FOUR OXYGEN-PRODUCING UNITS, each with an hourly capacity of 5,000 cubic metres 97 per cent. oxygen, are to be built at the Majejewka Metallurgical Works in connection with the blast furnaces. Subsidiary plant for isolation of krypton and xenon will also be erected.

APPROXIMATELY 900 MILLION ROUBLES will eventually be expended upon the construction of the nitrogen products works and a power station (27,000 kilowatts capacity) at the Czirtschikstroy combine located on the River Czirtschik in Central Asia. No less than 115 million roubles had already been expended up to the end of 1935, while a further 110 million roubles has already been allocated for the current year. In the autumn a temporary plant for heating fuel will be in operation with a capacity of 6,000 kilowatts. According to a report from Tiflis (reported in the "Chemische Industrie") plans have been approved for construction of nitrogen fertiliser and synthetic rubber works in the Sumgait region of Azerbaijan on the Apscheron Peninsula. Included in the production programme are ammonia, caustic soda, sulphuric acid, various alcohols (including ethyl alcohol from petroleum gases, isopropyl and butyl alcohol) and synthetic rubber (12,000 tons per annum).

CONSIDERABLE EXPANSION IN NICKEL PRODUCTION is reported to have been made in 1935 at the Ufalej Works, where the output amounted to about 1,800 tons as against only 860 tons in 1934. Strenuous efforts to increase nickel production in other parts of the Soviet Union are also on foot (reports "Chemische Industrie"). Work on the Orsk Nickel Combine has been accelerated and the experimental plant is almost completed. On the Kola Peninsular deep borings were commenced at the end of 1935 in an attempt to increase the nickel ore reserves in that area. Much exploratory work has also been carried out in the Norilsk district (Siberia).

### **Denmark**

THE INSECTICIDAL VALUE OF CRYOLITE POWDER is being investigated at the Research Institute for Plant Pathology at Lyngby, and promising results are announced in protection of beet and citrus fruits.

### **Sweden**

MANUFACTURE OF A SUBSTITUTE FOR MOTOR SPIRIT in the shape of charcoal briquettes will shortly be commenced at the Tving factory at Blekinge, which enjoys a Government subsidy. The commencing daily output will be four to five tons, utilising only deciduous woods although pinewood will be subsequently used as the raw material.

### **Estonia**

RESUMPTION OF WORKING AT THE STATE SHALE WORKS at the Kuckers Mines has been decided upon and work will be found for 200 employees. The new coking plant of the State Shale Works has now commenced production with a daily capacity of 100 tons oil. The equipment includes plant for recovery of light spirit which was formerly destroyed. Judging by the unfavourable results achieved in 1935 by the largest shale oil producer in Estonia (Estländische Steinöl A.-G.), the outlook for the Esthonian shale industry in general does not appear to be particularly promising, for this firm incurred a loss of 0.53 million crowns and the share capital has been correspondingly written down to the extent of 0.6 million crowns.

### **Belgium**

THE TUBIZE RAYON CO. is now exclusively engaged in acetate rayon manufacture after transferring its viscose plant to the Fabelta Co.

THE SOC. INDUSTRIELLE DE LA CELLULOSE SIDAC, manufacturers of transparent paper, is understood to have allocated considerable sums for technical investigations.

IN ITS REPORT OF LAST YEAR'S TRADING RESULTS the Photo-Produits Gevaert points out that export difficulties have not been completely overcome although exports increased to the extent anticipated from devaluation of the Belgian currency. The company operates subsidiaries or has interests in other concerns in Spain and Germany as well as in the Industrie Photographiques S.A., with headquarters in Lille.

## Far Eastern Chemical Notes

### **Dutch Indies**

PRODUCTION OF SULPHUR HAS BEEN RESUMED by the Kawah Poeti concern in the Bandoeng district, an annual output of 10,000 tons being contemplated.

### **Japan**

ZINC SULPHATE AND CHLORIDE (300 tons and 150 tons respectively, monthly) are to be produced in a new plant of Nippon Kokan K.K., at Osaka.

THE YOKOHAMA FACTORY OF TORYO KAGAKU KOGYO K.K. is now producing dimethyl sulphate (30 tons monthly) and dinitronaphthalene (10 tons monthly).

INTERMEDIATE PRODUCTS NOW MANUFACTURED by Kawamura Insatsu Kojo, Tokio, include anthranilic acid, ortho-nitro-para-chloraniline and chlorotoluidine sulphonlic acid.

JAPANESE PRODUCTION OF POTASSIUM CHLORATE increased considerably in 1935 to 2,900 tons (compared with 2,000 tons in 1934). A substantial proportion is now exported to China, where the match industry is enjoying a measure of prosperity. The principal Japanese producers of potassium chlorate are Nippon Soda K.K., Hodogaya Soda K.K., and Nippon Denki Kogyo K.K.

## Personal Notes

MR. CHARLES ENGHOLM, who has been a director of the Anglo-Metal Co., Ltd., since 1929, died on April 23.

SIR WILLIAM BRAGG, director of the Royal Institution, has been presented with the Faraday Medal, awarded annually by the Institution of Electrical Engineers.

SIR ROBERT MOND was invested on April 23 with the insignia of a Commander of the Legion of Honour at the Maison de Chimie, Paris.

MR. FRANK SCUDDER, of Cartmell Road, St. Annes-on-the-Sea, Lancs, analytical chemist, left £5,975 (net personality £5,880).

MR. DAVID A. BLAIR, chairman of Blairs, Ltd., died suddenly at his residence, 10 Cleveden Drive, Glasgow, W.2, on April 24.

MR. WILLIAM H. STEPHENSON has been elected a director of the East Hull Gas Co. Mr. Stephenson is associated with British Oil and Cake Mills and subsidiary companies at Hull.

COUNCILLOR JOHN E. UTTLEY, in business as a chemical manufacturer at Red Lees Works, Summit, Lancashire, has been elected chairman of the Littleborough District Council, of which he has been a member for 28 years.

MR. W. C. G. BALDWINS, B.A., Christ's College, Cambridge, has been awarded the Gordon Wigan prize in chemistry, value £30, for a dissertation entitled "Phenomena Associated with Optically Active Absorption Bands."

MR. GEORGE THURLAND PRIOR, F.R.S., of Uxbridge Road, Hatch End, Middlesex, Keeper of the Department of Minerals at the British Museum 1909-27, and president of the Mineralogical Society 1927-30, left £2,595 (net personality £937).

SIR HARRY FOSTER celebrated his eighty-first birthday on Wednesday. He is chairman of English Oilfields, Ltd., Hendies Lydenburg Platinum, Ltd., and United Tin Areas of Nigeria, Ltd.

MISS JOSEPHINE CLAYTON, only child of Mr. and Mrs. Joseph Clayton, of Oakhill, Roundhay Park Lane, Leeds, was married at St. Edmund's Church, Roundhay, last week to Mr. Peter R. Garnett, second son of the late Mr. Fred H. Garnett and Mrs. Garnett, of Hellifield. The bride's father is the chairman and founder of Clayton, Sons and Co., Ltd., and the bridegroom is a member of the firm of Horsfall, Garnett and Co., worsted spinners, of Dudley Hill.

MR. L. HORE BELISHA, Minister of Transport, will be the principal guest at the annual luncheon of the Mansion House Association on Transport at the Trocadero Restaurant, London, on Friday, May 8. Others who have promised to attend include Lord Melchett, Mr. Clement Davies, Sir Isidore Salmon, M.P., Sir William Larke, Lieut.-Colonel R. H. Ingham Clark and Mr. S. C. E. Lloyd. The luncheon will be followed by the annual meeting of the Association.

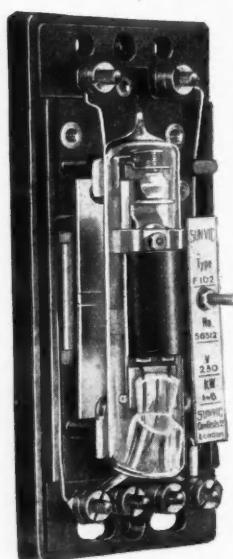
Messrs. F. H. TOWNDROW, J. L. WILLIAMS and E. J. PETTITT, three Port Sunlight managers, are retiring. Mr. Towndrow is manager of the quality and planning department, and in the course of his thirty-nine years with the firm has filled several important positions. Mr. J. L. Williams is in charge of the estates department, whilst Mr. E. J. Pettitt has been forty years with Lever Brothers and their associated Vinolia Co.

MAJOR W. E. SIMNETT delivered an address on "The Colonial Empire—Britain's Greatest Export Market" at a meeting of the Institute of Export at 21 Tothill Street, Westminster, on Tuesday. He said systematic, continuous and intelligent advertisement was essential, coupled with knowledge of local requirements obtained both directly and through reliable agents, and readiness to adapt one's practice to local market needs and conditions. In process of time and natural development the Colonial Empire, collectively already our largest oversea market, would become of the greatest importance to the future of British industry.

## Vacuum Switches and Thermostats

### Two Useful Appliances

THE Sun-Vic vacuum switch, supplied by Sun-Vic Controls, Ltd., is an ingenious relay that is of particular value for temperature or humidity control work. The smallest switch controls up to 2 kW at 230 volts a.c. or d.c., or 3 kW at 440 volts a.c. or d.c., and is vacuum sealed in a hard glass tube  $4\frac{1}{2}$  in. long  $\times \frac{1}{8}$  in. diameter, which can be mounted and operated in any position. This property coupled with the small size of the switch makes it ideal for incorporation in temperature controllers and similar apparatus. The movement of the main contacts of the switch is obtained by the thermal expansion of a control grid requiring about 2 watts input. This control circuit is non-inductive and its thermal operation provides an inherent time lag of about 1.5 seconds in the operation of the switch. These two factors make the



**Sun-Vic Vacuum Switch without cover. Rating 2 k.w at 230 volts A.C. or D.C.**



**Sun-Vic Vacuum Thermostat, fitted with SBC bayonet cap (full size).**

switch particularly suitable for operation with contact thermometers, toluol regulators, etc. The switch is silent in operation, and, due to the absence of arcing in vacuum, maintenance is not required for the switch or for the control contacts.

Small bimetal vacuum thermostats set for any required temperature and hermetically sealed in small glass tubes measuring  $2\frac{1}{2}$  in. long  $\times \frac{1}{8}$  in. diameter are also supplied by Sun-Vic Controls, Ltd. The setting of the thermostat cannot alter, since arcing and oxidising of the contacts cannot take place, and the ingress of dust, moisture or other foreign matter is completely prevented. The totally sealed construction permits the thermostat to be operated in corrosive or inflammable atmospheres. The thermostat will control up to 300 watts at 250 volts a.c. or d.c. and its applications within this power range include oil and water baths, photographic developing tanks, vulcanising processes, oil filter controls, etc.

THE development of the aluminium industry in Japan has created a marked increase in the demand for cryolite. The Dai Nihon Artificial Fertiliser Co. has succeeded in producing synthetic cryolite as a by-product of the manufacture of sodium silicofluoride and is also using the method of decomposition of fluorspar with sulphuric acid. Present production is reported to be at the rate of 55 metric tons per month, 15 tons by the former and 40 tons by the latter process. Further increases in production are anticipated in the near future with indications that the industry will be self-sufficient before the end of 1936.

## Chemical Matters in Parliament

### Coal Hydrogenation at Billingham

IN the House of Commons on April 27, Mr. T. Morris asked the Secretary for Mines what was the total amount of coal used at Billingham to produce, respectively, 100,000 tons of petrol from coal and 50,000 tons of petrol from creosote and low-temperature tar; and what was the amount of coal which would be used in both cases in an entirely new plant?

Captain Crookshank, in reply, said according to information made available by Imperial Chemical Industries, Ltd., the over-all raw coal consumption at Billingham for the production of 100,000 tons of petrol by the hydrogenation of coal was expected to be about 500,000 tons, and a further 100,000 tons would be used for the production of 50,000 tons of petrol by the hydrogenation of purchased creosote oil and tar. For a new plant it was estimated that the consumption of raw coal would vary from 3.5 to 4 tons per ton of petrol made by the hydrogenation of coal, the actual figure depending upon both the ash and moisture content of the coal and its suitability for the process.

### Anglo-Iranian Oil Co.

On April 28, Miss Rathbone asked the Chancellor of the Exchequer to what extent the shares held by His Majesty's Government in the Anglo-Iranian Oil Company have increased in value during the past year; and what rate of dividend has been declared by the company upon these shares during the past twelve months and during the preceding 12 months?

In reply, Mr. Chamberlain said the £1 ordinary shares of the Anglo-Iranian Oil Company were quoted on March 29, 1935 at 2 13/32 and on March 31, 1936, at 4 17/32. His Majesty's Government owns 7,500,000 of these shares. During the past 12 months the company has declared a dividend of 12½ per cent. for the year 1934 and an interim dividend of 5 per cent. in respect of 1935. In 1934-35 a dividend of 7½ per cent. was declared for the year 1933.

Mr. J. Griffiths then asked if some of this money could be utilised for pushing forward schemes for extracting oil from our own home-produced coal.

Mr. Mathers also asked if it would not be well for Mr. Chamberlain to urge, through his power as a shareholder in this company, the desirability of increasing the equipment in the shale fields which the company owns.

Both additional questions were ignored.

## Renewal of Key Industry Duties

### Encouraging Research and Development

THE Board of Trade Committee appointed to consider the position that will arise on the expiry, on August 19, of the duties imposed under Part I of the Safeguarding of Industries Act, 1921, has recommended that the key industry duties should be renewed in their present form for a further period of ten years at not less than the existing rates.

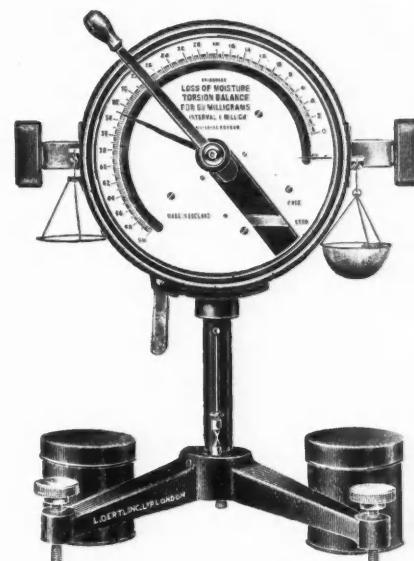
In the course of its report, the committee recommends that granular activated carbon of non-animal origin; ferrotitanium commercially carbon-free; carbon-free manganese metal; and chromium metal should be added to the schedule of articles chargeable with key industry duty, at a rate of 33½ per cent. *ad valorem*.

The committee expresses the opinion that the protection afforded to the key industries has encouraged research and fostered developments to an extent that would not otherwise have been possible. Despite intensive competition from abroad and a recent tendency for certain imports to increase, output had been multiplied in many cases. Satisfactory internal agreements had been made possible, and, in a number of instances, a considerable export trade had been built up.

## Loss of Moisture by Evaporation

### A Novel Balance of British Manufacture

OERTLING chemical balances and assay balances are described in great detail in two new brochures issued by L. Oertling, Ltd. Balances made by Oertling are in daily use in all the leading scientific institutions of the Empire, and also in many foreign countries. Established in 1849 in Store Street, Bedford Row, London, by the late L. Oertling, the firm was awarded the "Council Medal" of the Great Exhibition in 1851 and has now been manufacturing precision balances and weights of the highest grade for over 85 years. The policy of the founder was that every instrument bearing his name should be of the finest quality which British brains and crafts-



Torsion Balance for Ascertaining Loss of Moisture.

manship could devise, and that policy is maintained to-day. A special torsion balance for ascertaining loss of moisture is one of the novel features described in one of these brochures. From the accompanying illustration it will be seen that this balance is provided with a beam having two "arms"; the object to be weighed is counterpoised by weights, and the loss of weight through evaporation is read on the dial, having a range of 50 milligrams with a sensitivity of 0.1 milligram.

## Society of Chemical Industry

### Annual Meeting of Birmingham Section

At the annual meeting of the Birmingham and Midland Section of the Society of Chemical Industry, held at the Birmingham University on April 23, Mr. D. W. Parkes was elected chairman, and Mr. A. W. Knapp vice-chairman. The hon. secretary, Mr. G. King, and hon. treasurer, Mr. W. P. Collis, were re-elected.

A paper on "Safety Glass" was read by Mr. J. Wilson. He stated that tests had shown that cellulose acetate plastics, which had initially a lower bursting strength than cellulose and celluloid did not lose their strength and become brittle on ageing, but, on the other hand, adhesion to the glass layers often became very poor. A satisfactory method had been developed for overcoming this defect, and it was now possible to produce a cellulose acetate laminated glass that, in addition to the advantages outlined, did not discolour on exposure to light.

## Inventions in the Chemical Industry

THE following information is prepared from the Official Patents Journal. Printed copies of Specifications accepted may be obtained from the Patent Office, 25 Southampton Buildings, London, W.C.2, at 1s. each. The numbers given under "Applications for Patents" are for reference in all correspondence up to the acceptance of the Complete Specification.

### Specifications Open to Public Inspection

WASHING AGENTS CONTAINING SOAP, process for making.—J. A. Benckiser-Ges. Chemische Fabrik. Oct. 17, 1934. 4115/35.

STABILISING CHLORINATED HYDROCARBONS of low molecular weight, process.—I. G. Farbenindustrie. Oct. 20, 1934. 21549/35.

POLISHING-WAX COMPOSITIONS, manufacture.—E. I. du Pont de Nemours and Co. Oct. 17, 1934. 25482/35.

RECOVERY OF SULPHUR.—R. F. Bacon. Oct. 18, 1934. 26894-6-9/35.

SULPHONATING HIGHER ALIPHATIC CARBOXYLIC ACIDS and their esters, processes.—Hansawerke Lürman, Schutte, and Co. Oct. 18, 1934. 28760/35.

COLOURED PIGMENTS, manufacture and application.—I. G. Farbenindustrie. Oct. 19, 1934. 28992/35.

### Specifications Accepted with Date of Application

DYEING OR PRINTING OF TEXTILE MATERIALS.—Hall Laboratories, Inc. July 12, 1933. 445,466.

MERCURY COMPOUNDS containing nitrogen, process for the manufacture.—A. Carpmael (I. G. Farbenindustrie). July 13, 1934. 445,739.

CAKES AND OTHER CAKE-LIKE BAKED PRODUCTS and methods of making the same.—E. I. du Pont de Nemours and Co., Inc. Sept. 9, 1933. 445,768.

2-METHYL- $\beta:\beta'$ -NAPHTHIAZOLE and substitution products thereof.—W. W. Groves (I. G. Farbenindustrie). Sept. 13, 1934. 445,538.

RUBBER and its preparation for manufacture.—Dunlop Rubber Co., Ltd., E. A. Murphy, and E. W. Madge. Sept. 14, 1934. 445,542.

DERIVATIVES OF THE ANTHRAQUINONE SERIES, manufacture and production.—Coutts and Co., and F. Johnson (Legal representatives of J. Y. Johnson (deceased)). (I. G. Farbenindustrie). Oct. 1, 1934. 445,467.

ARSENIC ACID, manufacture.—Grasselli Chemical Co., and E. R. Boller. Oct. 3, 1934. 445,468.

OXYCHLORIDE CEMENTS.—A. G. Bloxam (Tajmal, Ltd.). Oct. 5, 1934. 445,613.

UTILISATION OF WHALE MEAT.—D. A. Hansen. Oct. 11, 1933. 445,545.

OBTAINING KRYPTON AND XENON, process and apparatus.—W. W. Groves (I. G. Farbenindustrie). Oct. 9, 1934. 445,472.

BINDING AGENTS for road construction.—W. W. Groves (I. G. Farbenindustrie). Oct. 9, 1934. 445,473.

WATER-INSOLUBLE AZO DYESTUFFS on wool materials.—I. G. Farbenindustrie. Oct. 10, 1933. 445,474.

HYDROCARBON OILS, heating.—Gyro Process Co. Oct. 9, 1933. 445,549.

ALDEHYDIC COMPOUNDS, manufacture.—E. I. du Pont de Nemours and Co., and J. A. Almquist. Oct. 10, 1934. 445,554.

ANAESTHETIC AGENTS, manufacture of stable preparations.—I. G. Farbenindustrie. Oct. 11, 1933. 445,555.

MIXED POLYVINYL RESINS and method of making same.—Shawinigan Chemicals, Ltd. Nov. 25, 1933. 445,565.

DELUSTERING OF LUSTROUS TEXTILE MATERIALS and articles made therefrom.—J. Craik, and Imperial Chemical Industries, Ltd. Oct. 12, 1934. 445,571.

PECTOUS MATERIAL and process of making the same.—Mutual Citrus Products Co., Inc. Oct. 16, 1933. 445,481.

PECTOUS MATERIAL and process of making the same.—Mutual Citrus Products Co., Inc. Oct. 16, 1933. 445,481.

CAST IRON OF IMPROVED CHARACTERISTICS, process of making.—Detroit Electric Furnace Co. Oct. 30, 1933. 445,700.

HETEROCYCLIC HYDROXY COMPOUNDS, process for the manufacture.—I. G. Farbenindustrie. Oct. 12, 1933. 445,581.

PRINTING INKS, comprising the dispersion of pigments in oils, production.—A. Chwala. Oct. 13, 1933. 445,701.

PIGMENTS, manufacture.—I. G. Farbenindustrie. Oct. 14, 1933. 445,587.

PIGMENTS, manufacture.—I. G. Farbenindustrie. Oct. 14, 1933. 445,588.

CALCINING DIATOMACEOUS EARTH, method.—Dicalite Co. March 29, 1934. 445,776-7.

PIGMENTS and their manufacture.—Krebs Pigment and Color Corporation. Oct. 16, 1933. 445,705.

RECOVERY OF SULPHUR DIOXIDE from gas mixtures.—A. M. Clark, W. E. Batten, C. F. R. Harrison, and Imperial Chemical Industries, Ltd. Oct. 16, 1934. 445,711.

PYRIDINE DYESTUFFS, manufacture.—I. G. Farbenindustrie. Oct. 18, 1933. 445,781.

YEAST, production.—Vereinigte Mautner Marklof'sche Presshefe Fabriken, and A. Szilvinyi. Oct. 20, 1933. 445,714.

CATALYSTS.—H. W. F. Gifford. Nov. 24, 1934. 445,727.

BASIC COPPER SULPHATES and ammonium sulphates, preparation.—M. Serciron. Jan. 16, 1934. 445,501.

MINERAL LUBRICATING-OILS, production.—Deutsche Gasolin A.-G. Jan. 4, 1934. 445,731.

ORGANIC SULPHUR COMPOUNDS, manufacture and production.—Coutts and Co., and F. Johnson (legal representatives of J. Y. Johnson (deceased)). Feb. 8, 1935. 445,805.

LUBRICATING-OIL COMPOSITION.—Standard Oil Development Co. July 14, 1934. 445,813.

CELLULOSE-ESTER WASTE, process for reducing the viscosity.—R. Spelling. May 17, 1935. 445,742.

MOTOR FUELS.—C. Arnold (Standard Oil Development Co.). June 4, 1935. 445,503.

PIGMENTED PAPER, method of making.—American Zinc, Lead and Smelting Co. July 31, 1934. 445,814.

SOAP in tablets or the like.—C. I. Meyer. Sept. 17, 1934. 445,815.

MAGNESIUM SULPHATE with a low water content or in the anhydrous condition, process of and apparatus for the production.—Metallges. A.-G. June 26, 1934. 445,605.

MALT, manufacture.—H. J. H. King, and W. S. Hopper. Aug. 8, 1935. 445,511.

LIQUEFIED GASES, means for operating internal-combustion engines.—I. G. Farbenindustrie. Aug. 18, 1934. 445,747.

### Applications for Patents

(April 16 to 22 inclusive.)

MOBILE COLLOIDS, manufacture.—D. Anderson and Son, Ltd. 11206.

LUBRICATING OILS.—Armour and Co. (United States, May 4, '35.) 11308.

COMPOSITIONS FROM COAL TAR, ETC.—Armour and Co. (United States, July 1, '35.) 11309.

LUBRICATING-OILS.—Armour and Co. (United States, July 1, '35.) 11310.

COAL TAR DISTILLATES.—Armour and Co. (United States, Aug. 21, '35.) 11311.

BASIC ESTERS, manufacture.—A. G. Bloxam. (Switzerland, April 2.) 11393.

WATER-SOLUBLE DERIVATIVES of cyclopentano-perhydro-phenanthrenes, manufacture.—A. Carpmael (I. G. Farbenindustrie). 11182.

DIAZOAMINO COMPOUNDS, manufacture.—Compagnie Nationale de Matieres Colorantes et Manufactures de Produits Chimiques du Nord Reunies Etablissements Kuhlmann. (France, April 20, '35.) 11107.

DIAZOAMINO COMPOUNDS, manufacture.—Compagnie Nationale de Matieres Colorantes et Manufactures de Produits Chimiques du Nord Reunies Etablissements Kuhlmann. (France, Oct. 11, '35.) 11108.

UREA-FORMALDEHYDE MOULDING POWDER, preparation.—S. W. Doherty, and J. E. Ferguson. 11296.

ADHESIVES, ETC.—E. I. du Pont de Nemours and Co. 11383.

ARYLIDES OF HYDROXY-ORTHO-CARBOXY-BENZOACRIDONES, manufacture.—W. W. Groves (I. G. Farbenindustrie). 10968.

ACRIDINIUM COMPOUNDS, manufacture.—I. G. Farbenindustrie. (Germany, April 20, '35.) 11270.

PROPELANT POWDERS.—Imperial Chemical Industries, Ltd., and T. Thomson. 11329.

PROCESS FOR INCREASING VISCOSITY OF TARS.—Imperial Chemical Industries, Ltd., and T. Thomson. 11330.

ETHYLIDENE DIACETATE, production.—G. W. Johnson (I. G. Farbenindustrie). 10965.

DERIVATIVES OF 1,4-DIAMINOANTHRAQUINONE, production.—G. W. Johnson (I. G. Farbenindustrie). 11077.

NITROGENOUS PRODUCTS, production.—G. W. Johnson (I. G. Farbenindustrie). 11366.

### Annual Meeting of Newton, Chambers & Co.

SIR SAMUEL ROBERTS announced at the annual meeting of Newton, Chambers and Co., Ltd., Sheffield, on Wednesday, that the company had secured a contract of considerable value from the Sheffield Gas Co. for a new purification plant, and that the chemical plant department had expanded considerably during the year. Among other orders taken had been one for a large benzol recovery plant for the Glasgow Corporation's gas department. For the third year in succession the profit of the company's chemical works had beaten previous records and, with the programme at present in hand, there was every reason to hope that this would continue. Research into new products continued unrelentingly and in the coal oils section considerable progress has been made.

## From Week to Week

THE BRITISH ROAD FEDERATION has issued in booklet form, a "Statement of Policy," with particular reference to the control and financing of the highway system of the country.

IN THE COMPANY'S COURT, Chancery Division, on Wednesday, Mr. Justice Bennett made an order for compulsory winding up of the Winchester Chemical Co., Ltd., there being no opposition.

BRITISH TAR PRODUCTS, LTD. are removing their Sheffield office on Monday next from 301 Glossop Road, to 418a Glossop Road, Sheffield, 10. (Telephone numbers 60078-60079.) Their telegraphic address remains "Cresol" Sheffield.

FORTY-NINE STUDENTS, four masters and eleven servants were gassed as a result of an explosion of chlorine gas in a receptacle at the Arts and Crafts School of Cairo, on April 22. All had to be taken to hospital. A number of firemen, called to rescue the students, suffered slightly from the effects of the gas.

A PRINTER'S ERROR OCCURRED in last week's paragraph relating to the spectrometers and direct vision instruments produced by the firm of John Browning. There is, of course, no such instrument in existence as a direct vision spectrometer, but the word "these" was accidentally substituted for "their" between the references to the two classes of instruments. Direct vision instruments are the special product of the firm.

SATISFACTORY PROSPECTS for the current year were reported by Mr. F. Wildblood at the statutory meeting of Blythe Colour Works, Ltd., on Monday, at Stoke-on-Trent. The sales to date, he said, showed an increase over the sales for the corresponding period of last year, and considerable progress had already been made in the new extensions to the works, which, when completed, would still further increase the potential output of the factory.

WHEN A CYLINDER CONTAINING OXYGEN EXPLODED at Rosyth Dockyard, on April 24, the noise was heard in Dunfermline, two miles away. The cylinder was one of a battery of nine in premises occupied by Metal Industries, Ltd. When it exploded the other cylinders were hurled in all directions. One of the cylinders became embedded in the wall of a storehouse and another was found near the dockyard depot ships, Greenwich and Ambrose. The force of the explosion shattered many windows.

THE AMERICAN SECTION of the Society of Chemical Industry announces the election of the following officers to serve for the year ending June 1, 1937: Chairman, Mr. James G. Vail; vice-chairman, Mr. Wallace P. Cohoe; hon. secretary, Mr. Foster Dee Snell; hon. treasurer, Mr. J. W. H. Randall. Five new members were elected to the executive committee to take the place of retiring members. Those newly elected are Messrs. N. Frey, R. J. McKay, A. A. Backus, L. S. Kohlstamm and S. P. Miller.

ENGINEERS EMPLOYED BY IMPERIAL CHEMICAL INDUSTRIES, LTD., Billingham-on-Tees, have decided to take a ballot on the question of striking to enforce the abolition of a grading scheme; a demand for a 20 per cent. increase in wages; recognition of shop stewards; and the abolition of medical examinations. It is, however, expected that the points at dispute will be settled by negotiation without resorting to drastic action. The process workers have also decided to ask for a penny an hour advance in wages. I.C.I. recently withdrew its membership from the General Industrial Council for the Chemical Trade, which negotiates with the trade unions regarding conditions and wages for process workers and labourers.

TRIBUTE TO THE ASSISTANCE which the Government has given to the rubber industry was paid at a lunch of the Research Association of Rubber Manufacturers in London, on April 24. Major J. H. Mandleberg said that the attitude of the Government had given them great cause for encouragement. Among a mass of legislation designed to prevent people from doing things it was refreshing to find practical help and advice and to find legislation designed to assist people to do things. Sir Andrew McFadyean said that in the long run the salvation of the industry rested in extending the uses of rubber, and in order that that extension might be brought about he believed that a very considerable sum of money ought to be devoted year after year to research.

IN SPITE OF THE ACTUAL ASSENTING to one half of the men's demand for an extra one penny per hour and a promise for a further consideration if the industry improves, china clay workers in Devon and Cornwall passed resolutions on April 25, protesting against the action of the china clay producers in refusing to meet their union representations at a joint conference to discuss a wages and conditions agreement. At a meeting at Plympton, workers from the china clay pits in that area passed a resolution protesting against the action of the employers and placing themselves unreservedly in the hands of the executive council of the union to take whatever steps it might consider necessary to enforce an agreement. The meeting was called by the Transport and General Workers' Union with which the china clay workers are identified.

THE CARBOY HAMPER MANUFACTURING BUSINESS of P. L. and G. S. Harris, Ltd., will, for domestic reasons, be conducted in future by Harris (Lostock Gralam), Ltd.

THE "JOURNAL OF THE INSTITUTION OF CIVIL ENGINEERS," for April, contains a paper on "Some Major Problems in the Utilisation of Coal" by F. S. Simmatt, an abstract of a paper on "Sewage Sludge" by Archibald Leitch, and reports of the work of the Chemical Research Laboratory and of research work in engineering at Bristol University.

THE EMPLOYEES OF JOHN BIBBY, seed crushers and oilseale factors, of Liverpool, who employ upwards of 2,500 people, will shortly benefit by an experiment which the directors have decided to try during the summer months—that of a five days working week. Mr. J. R. Bibby believes this is the first firm on Merseyside to extend the five-day week to the whole staff without reservation. It is being tried as an experiment during the summer months only, and everyone will get full pay.

THE INSTITUTION OF THE RUBBER INDUSTRY has applied for the grant of a royal charter, involving a change of name to the Institution of Rubber Technology. Speaking at the annual dinner of the Institution, Mr. James Fairbairn, past chairman of the Rubber Growers' Association, said the Institution had made wonderful progress during its 14 years' existence. Sir George Beharrell, president, stated that the petition for the charter was now before the Privy Council.

### Chemical Age Lawn Tennis Tournament

LAWN tennis players engaged in any capacity in the chemical profession or industry in Great Britain are eligible for free entry for the sixth annual *CHEMICAL AGE* Lawn Tennis Tournament, full particulars of which have been published in previous issues. This year for the first time it is possible for partners in the doubles to be members of separate firms.

**Monday week, May 11, is the last date for entries.**  
Immediate application should be made for copies of the rules and entry forms to The Editor, *THE CHEMICAL AGE*, Bouvierie House, 154 Fleet Street, London E.C.4. (Telephone: Central 3212.)

SHAREHOLDERS of the beet sugar factory companies of the Anglo-Dutch Group—English Beet Sugar Corporation, Home Grown Sugar, Ely Beet Sugar Factory, Ipswich Beet Sugar Factory and King's Lynn Beet Sugar Factory have approved the proposed action of the boards to take the necessary steps for the transfer of the assets to the British Sugar Corporation, Ltd., which is to be incorporated under the provisions of the British Sugar (Reorganisation) Bill.

THE OFFICIAL OPENING OF THE NEW COKE-OVEN PLANT of Wm. Dixon (Ltd.), Glasgow, took place on Monday. The plant will ensure an adequate supply of coke for Scottish furnaces and will add considerably to the production of pig iron in the country, which is at present below the home demand. About 750,000 tons of pig iron are used in Scotland per annum, of which only 440,000 tons are home produced. This development will enable the firm to compete with the manufacturers in England, Europe and India who are at the moment supplying about forty per cent. of the Scottish market. Benzol, oil, ammonia and ten million cu. ft. of gas will be produced as by-products. About five million cu. ft. of gas will be used for reheating in the works, and the rest will be available for sale to Glasgow Corporation as the proposed West of Scotland gas grid. The cost of erection of this plant was £250,000. Wm. Baird and Co. are considering a similar scheme, but on a larger scale, for their Yartshirrie furnaces at Coatbridge.

SODA ASH PRODUCTION by the Magadi Soda Co., Ltd., last year increased by nearly 14,000 tons to 43,122 tons, while deliveries increased by nearly 8,000 tons. Costs of production showed a satisfactory reduction, due mainly to the success of the wood fuel installation. Presiding at the annual meeting of the company on Tuesday, Mr. J. G. Nicholson said no extension of the salt plant had been made, although the capacity of the existing unit had been increased. Sales of salt had risen from 812 tons in 1934 to 1,716 tons, and, although owing to the relatively high cost of small-scale production, these sales had resulted in no profit, the realisations were sufficiently good to anticipate a reasonable return on a higher-scale output. Some 680 tons of minor alkali products had been sold during the year at a satisfactory profit. The change which had overtaken the company's fortunes since 1930 had been the inevitable consequence of inherent weaknesses in the geographical situation of the lake itself and the quality of its product, which had proved such severe handicaps in meeting the steadily intensifying competition of the last few years.

## Weekly Prices of British Chemical Products

THERE are no price changes to report in the markets for general heavy chemicals, rubber chemicals, wood distillation products, pharmaceutical and photographic chemicals, perfumery chemicals, essential oils and intermediates. In the coal tar products section the prices of cresylic acid, 99/100 and naphthalene (purified crystals) have been advanced, while pitch (medium, soft) has been reduced. Unless otherwise stated the prices below cover fair quantities net and naked at sellers' works.

**LONDON.**—Prices still remain steady with fair general demand.

**MANCHESTER.**—No great volume of fresh business in chemicals has been reported on the Manchester market during the past week. The moderate buying interest that has been in evidence has been concerned largely with parcels for spot or near delivery positions and in the aggregate the quantity has not been substan-

tial. On the other hand, there has been no apparent falling away in the rate at which most descriptions of chemicals, including the alkalis and the heavy acid materials, have been called for against existing contracts, and in some directions a slight improvement in this respect is reported in connection with the textile dyeing and finishing trades in Lancashire and the West Riding of Yorkshire. Among the by-products, offers in the pitch section are on an extremely low basis, but most other sections are steady, whilst marked firmness on the scarcity of supplies is a continued feature of both cresylic acid and the naphthalenes.

**SCOTLAND.**—There has been a slight improvement in the demand for chemicals for home trade during the week, but export inquiries are still limited. Prices generally continue very steady at about previous figures. Copper products are very firm in sympathy with the advancing tendency of the metal.

### General Chemicals

**ACETONE.**—**LONDON:** £62 to £65 per ton; **SCOTLAND:** £64 to £65 ex wharf, according to quantity.

**ACID, ACETIC.**—40% technical, £16 12s. 6d. per ton. **LONDON:** Tech., 80%, £30 5s. to £32 5s. per ton; pure 80%, £32 5s. to £34 5s.; tech., 40%, £16 12s. 6d. to £18 12s. 6d.; tech., 60%, £23 10s. to £25 10s. **SCOTLAND:** Glacial 98/100%, £48 to £52; pure 80%, £32 5s.; tech., 80%, £30 5s. d/d buyers' premises Great Britain. **MANCHESTER:** 80%, commercial, £30 5s.; tech. glacial, £48 to £50.

**ACID, BORIC.**—Commercial granulated, £27 per ton; crystal, £28; powdered, £29; extra finely powdered, £31; packed in 1-cwt. bags, carriage paid home to buyers' premises within the United Kingdom in 1-ton lots. **B.P. cryst.**, £36; **B.P. powder**, £37. **SCOTLAND:** Crystals, £28; powdered, £29.

**ACID, CHROMIC.**—Flaked, 10d. per lb., less 2½%; ground, 10d. per lb., less 2½%, d/d U.K.

**ACID, CITRIC.**—1s. per lb. **MANCHESTER:** 1s. **SCOTLAND:** 11½d. **ACID, CRESYLIC.**—97/100%, 1s. 5d. to 1s. 6d. per gal.; 99/100%, refined, 1s. 9d. to 1s. 10d. per gal. **LONDON:** 98/100%, 1s. 5d. f.o.r.; dark, 1s.

**ACID, FORMIC.**—**LONDON:** £42 to £47 per ton.

**ACID, HYDROCHLORIC.**—Spot, 4s. to 6s. carboy d/d according to purity, strength and locality. **SCOTLAND:** Arsenical quality, 4s.; dearsenicated, 5s. ex works, full wagon loads.

**ACID, LACTIC.**—**LANCASHIRE:** Dark tech., 50% by vol., £24 10s. per ton; 50% by weight, £28 10s.; 80% by weight, £50; pale tech., 50% by vol., £28; 50% by weight, £33; 80% by weight, £55; edible, 50% by vol., £41. One-ton lots ex works, barrels free.

**ACID, NITRIC.**—80° Tw. spot, £18 to £25 per ton makers' works. **SCOTLAND:** 80°, £24 ex station full truck loads.

**ACID, OXALIC.**—**LONDON:** £47 17s. 6d. to £57 10s. per ton, according to packages and position. **SCOTLAND:** 98/100%, £48 to £50 ex store. **MANCHESTER:** £48 10s. to £55 ex store.

**ACID, SULPHURIC.**—**SCOTLAND:** 144° quality, £3 12s. 6d.; 168°, £7; dearsenicated, 20s. per ton extra.

**ACID, TARTARIC.**—1s. per lb. less 5%, carriage paid for lots of 5 cwt. and upwards. **LONDON:** 11½d. less 5%. **SCOTLAND:** 1s. 0½d. less 5%. **MANCHESTER:** 1s. per lb.

**ALUM.**—**SCOTLAND:** Lump potash, £8 10s. per ton ex store.

**ALUMINA SULPHATE.**—**LONDON:** £7 10s. to £8 per ton. **SCOTLAND:** £7 to £8 ex store.

**AMMONIA, ANHYDROUS.**—Spot, 10d. per lb. d/d in cylinders. **SCOTLAND:** 10d. to 1s. containers extra and returnable.

**AMMONIA, LIQUID.**—**SCOTLAND:** 80°, 2½d. to 3d. per lb., d/d.

**AMMONIUM BICHROMATE.**—8d. per lb. d/d U.K.

**AMMONIUM CARBONATE.**—**SCOTLAND:** Lump, £30 per ton; powdered, £33, in 5-cwt. casks d/d buyers' premises U.K.

**AMMONIUM CHLORIDE.**—**LONDON:** Fine white crystals, £18 to £19. (See also Salammoniac.)

**AMMONIUM CHLORIDE (MURIATE).**—**SCOTLAND:** British dog tooth crystals, £32 to £35 per ton carriage paid according to quantity. (See also Salammoniac.)

**AMMONIUM SULPHATE.**—Neutral quality, 20.6% nitrogen, £7 per ton.

**ANTIMONY OXIDE.**—**SCOTLAND:** £61 to £65 per ton, c.i.f. U.K. ports.

**ANTIMONY SULPHIDE.**—Golden, 6½d. to 1s. 1d. per lb.; crimson, 1s. 5½d. to 1s. 7d. per lb., according to quality.

**ARSENIC.**—**LONDON:** £15 per ton c.i.f. main U.K. ports for imported material; Cornish nominal, £22 10s. f.o.r. mines.

**SCOTLAND:** White powdered, £23 ex wharf. **MANCHESTER:** White powdered Cornish, £21 ex store.

**ARSENIC SULPHIDE.**—Yellow, 1s. 5d. to 1s. 7d. per lb.

**BARIUM CHLORIDE.**—**LONDON:** £10 10s. per ton. **SCOTLAND:** £10 10s. to £10 15s.

**BARYTES.**—£6 10s. to £8 per ton.

**BISULPHITE OF LIME.**—£6 10s. per ton f.o.r. London.

**BLEACHING POWDER.**—Spot, 35/37%, £7 10s. per ton d/d station

in casks, special terms for contract. **SCOTLAND:** £9 5s.

**BORAX, COMMERCIAL.**—Granulated, £14 10s. per ton; crystal, £15 10s.; powdered, £16; finely powdered, £17; packed in 1-cwt. bags, carriage paid home to buyer's premises within the United Kingdom in 1-ton lots.

**CADMUM SULPHIDE.**—5s. 2d. to 5s. 5d. per lb.

**CALCIUM CHLORIDE.**—Solid 70/75% spot, £5 5s. per ton d/d station in drums.

**CARBON BISULPHIDE.**—£31 to £33 per ton, drums extra.

**CARBON BLACK.**—3½d. to 4½d. per lb. **LONDON:** 4½d. to 5d.

**CARBON TETRACHLORIDE.**—**SCOTLAND:** £41 to £43 per ton, drums extra.

**CHROMIUM OXIDE.**—10½d. per lb., according to quantity d/d U.K.; green, 1s. 2d. per lb.

**CHROMETAN.**—Crystals, 2½d. per lb.; liquor, £19 10s. per ton d/d

**COPPERAS (GREEN).**—**SCOTLAND:** £3 15s. per ton, f.o.r. or ex works.

**CREAM OF TARTAR.**—£3 19s. per cwt. less 2½%. **LONDON:** £3 17s. per cwt. **SCOTLAND:** £3 16s. 6d. net.

**DINITROTOLUENE.**—66/68° C., 9d. per lb.

**DIPHENYLGUANIDINE.**—2s. 2d. per lb.

**FORMALDEHYDE.**—**LONDON:** £24 10s. per ton. **SCOTLAND:** 40%, £25 to £28 ex store.

**IODINE.**—Resublimed B.P., 6s. 3d. to 8s. 4d. per lb.

**LAMPBLACK.**—£45 to £48 per ton.

**LEAD ACETATE.**—**LONDON:** White, £36 10s. per ton; brown, £1 per ton less. **SCOTLAND:** White crystals, £34 to £35; brown, £1 per ton less. **MANCHESTER:** White, £36; brown, £35.

**LEAD NITRATE.**—£32 10s. to £34 10s. per ton.

**LEAD, RED.**—**SCOTLAND:** £26 to £28 per ton less 2½%; d/d buyer's works.

**LEAD, WHITE.**—**SCOTLAND:** £39 per ton, carriage paid. **LONDON:** £41.

**LITHOPONE.**—30%, £16 5s. to £16 10s. per ton.

**MAGNESITE.**—**SCOTLAND:** Ground calcined, £9 per ton, ex store.

**MAGNESIUM CHLORIDE.**—**SCOTLAND:** £7 per ton.

**MAGNESIUM SULPHATE.**—Commercial, £5 per ton, ex wharf.

**METHYLATED SPIRIT.**—61 O.P. industrial, 1s. 5d. to 2s. 2d.; mineralised, 2s. 6d. to 3s. Spirit 64 O.P. is 1d. more in all cases and the range of prices is according to quantities. **SCOTLAND:** Industrial 64 O.P., 1s. 9d. to 2s. 4d.

**PHENOL.**—6½d. to 7d. per lb. to June 30, 1936.

**POTASH, CAUSTIC.**—**LONDON:** £42 per ton. **MANCHESTER:** £38 10s.

**POTASSIUM BICHROMATE.**—Crystals and Granular, 5d. per lb. less 5%, d/d U.K. Ground, 5½d. **LONDON:** 5d. per lb. less 5%, with discounts for contracts. **SCOTLAND:** 5d. d/d U.K. or c.i.f. Irish Ports. **MANCHESTER:** 5d.

**POTASSIUM CHLORATE.**—**LONDON:** £37 to £40 per ton. **SCOTLAND:** 99½/100%, powder, £37. **MANCHESTER:** £39.

**POTASSIUM CHROMATE.**—6½d. per lb. d/d U.K.

**POTASSIUM IODIDE.**—B.P., 5s. 2d. per lb.

**POTASSIUM NITRATE.**—**SCOTLAND:** Refined granulated, £29 per ton c.i.f. U.K. ports. **SCOTLAND:** Spot, £30 per ton ex store.

**POTASSIUM PERMANGANATE.**—**LONDON:** 8½d. per lb. **SCOTLAND:** B.P. crystals, 10d. to 10½d. **MANCHESTER:** B.P., 11½d.

**POTASSIUM PRUSSIATE.**—**LONDON:** Yellow, 8½d. to 8¾d. per lb. **SCOTLAND:** Yellow spot, 8½d. ex store. **MANCHESTER:** Yellow, 8½d.

**SALAMMONIAC.**—First lump spot, £41 17s. 6d. per ton d/d in barrels. **SCOTLAND:** Large crystals in casks, £36.

**SODA ASH.**—58% spot, £5 12s. 6d. per ton f.o.r. in bags. **SODA, CAUSTIC.**—Solid, 76/77% spot, £13 17s. 6d. per ton d/d station. **SCOTLAND:** Powdered 98/99%, £17 10s. in drums, £18 5s. in casks. Solid 76/77%, £14 12s. 6d. in drums; 70/73%, £14 12s. 6d., carriage paid buyer's station, minimum 4-ton lots; contracts 10s. per ton less. **MANCHESTER:** £13 5s. to £14 contracts.

**SODA CRYSTALS.**—Spot, £5 to £5 5s. per ton d/d station or ex depot in 2-cwt. bags.

SODIUM ACETATE.—LONDON: £21 per ton. SCOTLAND: £20 15s. SODIUM BICARBONATE.—Refined spot, £10 10s. per ton d/a station in bags. SCOTLAND: Refined recrystallised £10 15s. ex quay or station. MANCHESTER: £10 10s.

SODIUM BICHROMATE.—Crystals cake and powder 4d. per lb. net d/d U.K. discount 5%. Anhydrous, 5d. per lb. LONDON: 4d. per lb. less 5% for spot lots and 4d. per lb. with discounts for contract quantities. MANCHESTER: 4d. per lb. basis. SCOTLAND: 4d. delivered buyer's premises with concession for contracts.

SODIUM BISULPHITE POWDER.—60/62%, £20 per ton d/d 1 cwt. iron drums for home trade.

SODIUM CARBONATE, MONOHYDRATE.—£15 per ton d/d in minimum ton lots in 2 cwt. free bags. Soda crystals, SCOTLAND: £5 to £5 5s. per ton ex quay or station. Powdered or pea quality, 7s. 6d. per ton extra. Light Soda Ash, £7 ex quay, min. 4-ton lots with reductions for contracts.

SODIUM CHLORATE.—£29 per ton. SCOTLAND: 3½d. per lb.

SODIUM CHROMATE.—4d. per lb. d/d U.K.

SODIUM HYPOSULPHITE.—SCOTLAND: Large crystals English manufacture, £9 5s. per ton ex stations, min. 4-ton lots. Pea crystals, £14 10s. ex station, 4-ton lots. MANCHESTER: Commercial, £10 5s.; photographic, £14 10s.

SODIUM METASILICATE.—£14 per ton, d/d U.K. in cwt. bags.

SODIUM IODIDE.—B.P., 6s. per lb.

SODIUM NITRITE.—LONDON: Spot, £18 5s. to £20 5s. per ton d/d station in drums.

SODIUM PERBORATE.—10%, 9d. per lb. d/d in 1-cwt. drums. LONDON: 10d. per lb.

SODIUM PHOSPHATE.—£13 per ton.

SODIUM PRUSSITE.—LONDON: 5d. to 5½d. per lb. SCOTLAND: 5d. to 5½d. ex store. MANCHESTER: 5d. to 5½d.

SODIUM SILICATE.—140° Tw. Spot, £8 per ton. SCOTLAND: £8 16s.

SODIUM SULPHATE (GLAUBER SALTS).—£4 2s. 6d. per ton d/d SCOTLAND: English material, £3 15s.

SODIUM SULPHATE (SALT CAKE).—Unground spot, £3 12s. 6d. per ton d/d station in bulk. SCOTLAND: Ground quality, £3 5s. per ton d/d. MANCHESTER: £3 5s.

SODIUM SULPHIDE.—Solid 60/62% Spot, £10 15s. per ton d/d in drums; crystals 30/32%, £8 per ton d/d in casks. SCOTLAND: For home consumption. Solid 60/62%, £10 5s.; broken 60/62%, £11 5s.; crystals, 30/32%, £8 7s. 6d., d/d buyer's works on contract, min. 4-ton lots. Spot solid, 5s. per ton extra. Crystals, 2s. 6d. per ton extra. MANCHESTER: Concentrated solid, 60/62%, £11; commercial, £8 2s. 6d.

SODIUM SULPHITE.—Pea crystals, spot, £13 10s. per ton d/d station in kegs. Commercial spot, £8 15s. d/d station in bags.

SULPHUR.—£9 to £9 5s. per ton. SCOTLAND: £8 to £9.

SULPHATE OF COPPER.—MANCHESTER: £15 per ton f.o.b.

SULPHUR CHLORIDE.—5d. to 7d. per lb., according to quality.

SULPHUR PRECIP.—B.P., £55 to £60 per ton according to quantity. Commercial, £50 to £55.

VERMILION.—Pale or deep, 5s. 1d. per lb. in 1-cwt. lots.

ZINC CHLORIDE.—SCOTLAND: British material, 98%, £18 10s. per ton f.o.b. U.K. ports.

ZINC SULPHATE.—LONDON: £12 per ton. SCOTLAND: £10 10s.

ZINC SULPHIDE.—10d. to 11d. per lb.

### Nitrogen Fertilisers

SULPHATE OF AMMONIA.—£7 5s. per ton for neutral quality basis 20.6% nitrogen delivered in 6-ton lots to farmer's nearest station.

CALCIUM CYANAMIDE.—£7 5s. per ton, delivered in 4-ton lots.

NITRO-CHALK.—£7 5s. per ton delivered in 6-ton lots to farmer's nearest station.

NITRATE OF SODA.—£7 12s. 6d. per ton delivered in 6-ton lots to farmer's nearest station.

CONCENTRATED COMPLETE FERTILISERS.—£10 10s. to £10 19s. per ton according to analysis, delivered in 6-ton lots to farmer's nearest station.

AMMONIUM PHOSPHATE (N.P.) FERTILISERS.—£10 5s. to £13 15s. per ton according to analysis, delivered in 6-ton lots to farmer's nearest station.

### Coal Tar Products

ACID, CRESYLIC.—99/100%, 2s. 4d. to 3s. 6d. per gal., according to specification; pale 98%, 2s. 6d. to 2s. 8d.; dark, 1s. 9d. to 1s. 10d. LONDON: 98/100%, 1s. 4d.; dark, 95/97%, 1s. SCOTLAND: Pale, 99/100%, 1s. 3d. to 1s. 4d.; dark, 97/99%, 1s. to 1s. 1d.; high boiling acid, 2s. 6d. to 3s.

ACID, CARBOLIC.—Crystals, 6½d. to 7½d. per lb.; crude, 60's, 2s. 3d. to 2s. 6d. per gal. MANCHESTER: Crystals, 6½d. to 7d. per lb.; crude, 2s. 2d. per gal. SCOTLAND: 60's, 2s. 6d. to 2s. 7d.

BENZOL.—At works, crude, 8½d. to 9d. per gal.; standard motor 1s. 2d. to 1s. 2½d.; 90%, 1s. 3d. to 1s. 3½d.; pure, 1s. 7d. to 1s. 7½d. LONDON: Motor, 1s 3½d. SCOTLAND: Motor, 1s. 6½d.

CREOSOTE.—B.S.I. Specification standard, 5½d. per gal. f.o.r. Home, 3½d. d/d. LONDON: 4d. f.o.r. North; 3d. London. MANCHESTER: 5d. SCOTLAND: Specification oils, 4d.; washed oil, 4½d. to 4¾d.; light, 4½d.; heavy, 4½d. to 4¾d.

NAPHTHA.—Solvent, 90/100%, 1s. 5½d. to 1s. 6½d. per gal.; 95/160%, 1s. 9d.; 90%, 1s. to 1s. 2d. LONDON: Solvent, 1s. 3½d. to 1s. 4d.; heavy, 11d. to 1s. 0½d. f.o.r. SCOTLAND: 90/160%, 1s. 3d. to 1s. 3½d.; 90/190%, 11d. to 1s. 2d.

NAPHTHALENE.—Crude, whizzed or hot pressed, £17 10s. per ton; purified crystals, £28 to £29 per ton in 2-cwt. bags. LONDON: Fire lighter quality, £3 to £3 10s.; 74/76 quality, £4 to £4 10s.; 76/78 quality, £5 10s. to £6. SCOTLAND: 40s. to 50s.; whizzed, 70s. to 75s.

PYRIDINE.—90/140%, 5s. 3d. to 7s. 6d. per gal.; 90/180, 2s. 3d. TOLUOL.—90%, 2s. 3d. per gal.; pure, 2s. 7d.

XYLOL.—Commercial, 2s. 2d. per gal.; pure, 2s. 4d.

PITCH.—Medium, soft, 37s. 6d. per ton, in bulk at makers works. MANCHESTER: 32s. 6d. f.o.b., East Coast.

### Wood Distillation Products

ACETATE OF LIME.—Brown, £7 15s. to £8 10s. per ton; grey, £10 8s. to £11. Liquor, brown, 30° Tw., 8d. per gal. MANCHESTER: Brown, £10; grey, £11.

CHARCOAL.—£5 to £10 per ton, according to grade and locality.

METHYL ACETONE.—40-50%, £46 to £50 per ton.

WOOD CREOSOTE.—Unrefined, 6d. to 1s. 3d. per gal.

WOOD NAPHTHA, MISCELL.—2s. 6d. to 3s. 3d. per gal.; solvent, 3s. to 4s. per gal.

WOOD TAR.—£2 to £2 10s. per ton.

### Intermediates and Dyes

ACID, BENZOIC, 1914 B.P. (ex Toluol).—1s. 9½d. per lb.

ACID, GAMMA.—Spot, 4s. per lb. 100% d/d buyer's works.

ACID, H.—Spot, 2s. 4½d. per lb. 100% d/d buyer's works.

ACID NAPHTHIONIC.—1s. 8d. per lb.

ACID, NEVILLE AND WINTHROP.—Spot, 3s. per lb. 100%.

ACID, SULPHANILIC.—Spot, 8d. per lb. 100%, d/d buyer's works.

ANILINE OIL.—Spot, 8d. per lb., drums extra, d/d buyer's works.

ANILINE SALTS.—Spot, 8d. per lb. d/d buyer's works, casks free.

BENZALDEHYDE.—Spot, 1s. 8d. per lb., packages extra.

BENZIDINE BASE.—Spot, 2s. 5d. per lb., 100% d/d buyer's works.

BENZIDINE HCL.—2s. 5d. per lb.

*o*-CRESOL 30/31° C.—6d. per lb. in 1-ton lots.

*p*-CRESOL 34-5° C.—1s. 6d. per lb. in ton lots.

*m*-CRESOL 98/100%—1s. 7d. per lb. in ton lots.

DICHLORANILINE.—1s. 11½d. to 2s. 3d. per lb.

DIMETHYLANILINE.—Spot, 1s. 6d. per lb., package extra.

DINITROTOLUENE.—2s. 5d. per lb.

DINITROCHLORBENZENE, SOLID.—£72 per ton.

DIPHENYLAMINE.—Spot, 2s. 4d. per lb., d/d buyer's works.

$\alpha$ -NAPHTHOL.—Spot, 2s. 4d. per lb., d/d buyer's works.

$\beta$ -NAPHTHOL.—In bags, £88 15s. per ton; in casks, £89 15s.

$\alpha$ -NAPHTHYLAMINE.—Lumps, 1s. per lb.; ground, 1s. 0½d.

$\beta$ -NAPHTHYLAMINE.—Spot, 2s. 9d. per lb., d/d buyer's works.

*o*-NITRANILINE.—3s. 11d. per lb.

*m*-NITRANILINE.—Spot, 2s. 7d. per lb., d/d buyer's works.

*p*-NITRANILINE.—Spot, 1s. 8d. per lb., d/d buyer's works.

NITROBENZENE.—Spot, 4d. to 5d. per lb.; 5-owt. lots, drums extra.

NITRONAPHTHALENE.—9d. per lb.; P.G., 1s. 0½d. per lb.

SODIUM NAPHTHIONATE.—Spot, 1s. 9d. per lb.

*o*-TOLUIDINE.—9d. to 11d. per lb.

*p*-TOLUIDINE.—1s. 11d. per lb.

### Latest Oil Prices

LONDON, April 29.—LINSEED OIL was slow. Spot, £28 10s. (small quantities); May, £26; June-Aug., £26 2s. 6d.; Sept.-Dec., £26 5s.; Jan.-April, £26 7s. 6d., naked. SOYA BEAN OIL was quiet. Oriental (bulk), April shipment, £21 12s. 6d. RAPE OIL was inactive. Crude extracted, £34 10s.; technical refined, £36, naked, ex wharf. COTTON OIL was dull. Egyptian crude, £24 10s.; refined common edible, £27 15s.; deodorised, £29 15s., naked, ex mill (small lots £1 10s. extra). TURPENTINE was again lower. American, spot, 38s. 3d. per cwt.

HULL.—LINSEED OIL, spot, quoted £26 15s. per ton; April, £26 2s. 6d.; May-Aug., £26 5s.; Sept.-Dec., £26 7s. 6d. COTTON OIL, Egyptian, crude, spot, £24 15s.; edible, refined, spot, £27 5s.; technical, spot, £27 5s.; deodorised, £29 5s.; naked. GROUNDNUT OIL, extracted, spot, £31; deodorised, £34. RAPE OIL, extracted, spot, £33 10s.; refined, £35. SOYA OIL, extracted, spot, £27; deodorised, £30 per ton. COD OIL, f.o.r. or f.a.s., 25s. per cwt., in barrels. CASTER OIL, pharmaceutical 42s. 6d. per cwt.; firsts, 37s. 6d.; seconds, 35s. 6d. TURPENTINE, American, spot, 41s. 9d. per cwt.

## Chemical and Allied Stocks and Shares

THE industrial section of the Stock Exchange has been steady, and although shares of companies connected with the chemical and allied trades show few important changes on balance for the week they were not without individual features of interest. Imperial Chemical have been well maintained, aided by the statements at the meeting, which indicated that business in the home market is increasing. There has been rather more activity reported in the company's preference shares, the investment merits of which were emphasised by the recently-issued results. British Cyanides and United Molasses received more attention. Both companies are still expected in the market to issue progress reports shortly, and it continues to be hoped that they may resume the practice of paying interim dividends. Salt Union have been steadier. In this case the market is still taking the view that a bonus of some kind is likely as time proceeds, but there has never been any official indication that this is contemplated. Fison, Packard & Prentice were firmer on the continued hopes of a larger interim dividend. It is realised that a larger capital now ranks for dividend, but it is assumed in the market that the further extensions to the business are resulting in increased profits, and a larger total dividend for the year is generally believed to be very likely. Lawes Chemical Manure were little changed and continue to be held firmly. It may be remembered that in respect of the past year there was an increase in the company's net profits from £6,103 to £10,606 and that the dividend was raised from 2½ per cent. to 5 per cent. British Drug Houses were unchanged but steady, and William Blythe were also unchanged on balance for the week. B. Laporte held up well on confidence in the market that the dividend will again be brought up to 20 per cent. There was again increased interest in the deferred shares of Borax Consolidated on the belief

that the company is making further excellent progress towards regaining the good level of earnings which ruled in the past. Unilever were little changed on the week, awaiting the annual meeting on May 6. There was larger demand reported for the company's 7 per cent. cumulative preferred shares, the dividend on which requires £232,067. The latter was covered many times over by the increased net profits of £1,471,964, shown by the recently issued results. Lever Brothers preference have continued to receive a good deal of attention in view of the apparently satisfactory yields offered. They are favoured in some quarters because they probably have a more active market than the preference shares of any other industrial company. Boots Pure Drug have been in demand on any reaction, there being continued anticipations in the market that the forthcoming results may announce a share bonus. The company has large reserves and has built up a strong financial position, while the numerous subsidiary companies also have considerable reserves. According to some market views the company may give a good deal of attention during the next few years to the extension of business to the Dominions. Imperial Smelting have remained steady in view of the satisfactory trend in the price of zinc. Distillers continued very firm, awaiting the forthcoming results of various of the subsidiaries. Triplex Safety Glass was another share which held up well. Pinchin Johnson have been steady and Lewis Berger were higher on favourable views of dividend prospects. Blythe Colour Works were firm following the statutory meeting, where it was stated that sales to-date show an increase over the corresponding period of last year, and that good progress is being made in connection with the company's works extensions. Oil shares have remained active in anticipation of the impending dividend announcements, but best prices were not held.

Name.	Apr. 28.	Apr. 21.	Name.	Apr. 28.	Apr. 21.
Anglo-Iranian Oil Co., Ltd. Ord.	93/9	95 7½	Goodlass Wall & Lead Industries, Ltd.	14/1½	14/1½
Associated Dyers and Cleaners, Ltd. Ord.	1/10½	1/10½	Ord. (10/-)	13/1½	13/1½
Associated Portland Cement Manufacturers, Ltd. Ord.	89 4½	89 4½	,, 7% Prefd. Ord. (10/-)	28/9	28/9
,, 5½% Cum. Pref.	28/9	28/6	,, 7% Cum. Pref.		
Benzol & By-Products, Ltd. 6% Cum. Part Pref.	6/3	6/3	Gossage, William, & Sons, Ltd. 6½% Cum. Pref.	30/-	28/9
Berger (Lewis) & Sons, Ltd. Ord.	.71/3	70/-	Imperial Chemical Industries, Ltd. Ord.	39/9	39/9
Bleachers' Association, Ltd. Ord.	5/7½	5/7½	,, Deferred (10/-)	9/7½	9/7½
Boake, A., Roberts & Co., Ltd. 5% Pref. (Cum.)	20/-	20/-	,, 7% Cum. Pref.	34/-	33/9
Boots Pure Drug Co., Ltd. Ord. (5/-)	56/3	55/9	Imperial Smelting Corporation, Ltd. Ord.	17/3	17/6
Borax Consolidated, Ltd. Pfd. Ord. (£)	112/6	112/6	Cum.	\$46½	\$48½
,, Defd. Ord.	30/10½	30/-	Johnson, Matthey & Co., Ltd. 5% Cum. Pref. (£5)	105/-	105/-
,, 5½% Cum. Pref. (£10)	£11/17 6/6	£11/17 6/6	Laporte, B., Ltd. Ord.	120/-	120/-
Bradford Dyers' Association, Ltd. Ord.	8/1½	8/1½	Lawes Chemical Co., Ltd. Ord. (10/-)	8/9	8/9
British Celanese, Ltd. 7% 1st Cum. Pfd.	24/-	24/9	,, 7% Non-Cum. Part Pref. (10/-)	10/-	10/-
British Cotton & Wool Dyers' Association Ltd. Ord. (5/-)	5/9	5/9	Lever Bros., Ltd. 7% Cum. Pref.	38/6	33/-
British Cyanides Co., Ltd. Ord. (2/-)	4/-	4/-	Magadi Soda Co., Ltd. 12½% Pref. Ord. (5/-)	1/3	1/3
British Drug Houses, Ltd. Ord.	20/-	21/3	,, 6% 2nd Pref. (5/-)	6d.	6d.
,, 5% Cum. Pref.	22/6	22/6	,, 6% 1st Debs. (Reg.)	£40	£40
British Glues and Chemicals, Ltd. Ord. (4/-)	10/-	9/6	Major & Co., Ltd. Ord. (5/-)	7½d.	7½d.
,, 8% Pref. (Cum. and Part.)	30/-	30/-	,, 8% Part. Prefd. Ord. (10/-)	9d.	9d.
British Oil and Cake Mills, Ltd. Cum. Pfd. Ord.	49/-	48/9	,, 7½% Cum. Pref.	1/6½	1/6½
British Oxygen Co., Ltd. Ord.	95/-	95/-	Pinchin, Johnson & Co., Ltd. Ord. (10/-)	46/6	46/6
,, 6½% Cum. Pref.	32/6	32/6	Potash Syndicate of Germany 7% Gld. Ln. Sr. "A" and "B" Rd.	£79	£78
British Portland Cement Manufacturers, Ltd. Ord.	95/-	92/6	Reckitt & Sons, Ltd. Ord.	115/-	115/-
Bryant & May, Ltd. Pref.	66/3	66/3	Salt Union, Ltd. Ord.	45/-	45/-
Burt, Boulton & Haywood, Ltd. Ord.	21/3	21/3	,, Pref.	47/6	48/1½
,, 7% Cum. Pref.	28/9	28/9	South Metropolitan Gas Co. Ord. (£100)	£125/10/-	£125/10/-
,, 6% 1st Mort. Deb. Red. (£100)	£102/10/-	£102/10/-	Staveley Coal and Iron Co., Ltd. Ord.	54/4½	53/9
Bush, W. J., & Co., Ltd. 5% Cum. Pref. (£5)	108/9	108/9	Stevenson & Howell, Ltd. 6½% Cum. Pref.	26/3	26/3
,, 4% 1st Mort. Deb. Red. (£100)	£94/10/-	£94/10/-	Triplex Safety Glass Co., Ltd. Ord. (10/-)	94/4½	91/10½
Calico Printers' Association, Ltd. Ord.	7/6	8/1½	Unilever, Ltd. Ord.	31/10½	31/10½
Cellulose Acetate Silk Co., Ltd. Ord.	10/11½	11/6	United Glass Bottle Manufacturers, Ltd. Ord.	16/3	46/3
Consett Iron Co., Ltd. Ord.	11/6	11/6	,,	25/-	23/9
Cooper, McDonald & Robertson, Ltd. Ord.	35/-	35/-	United Molasses Co., Ltd. Ord. (6/8)	10/7½	11/3
,, 7% Cum. Pref.	28/9	28/9	United Premier Oil & Cake Co., Ltd. Ord. (5/-)		
Courtlands, Ltd. Ord.	48/9	49/4½			
Crosfield, Joseph, & Sons, Ltd. 5% Cum. Pre. Pref.	25/-	25/-			
Distillers Co., Ltd. Ord.	101/-	101/-			
,, 6% Pref. Stock Cum.	31/-	30/-			
Dorman Long & Co., Ltd. Ord.	31/3	28/9			
English Velvet & Cord Dyers' Association Ltd. Ord.	3/9	3/9			
Fison, Packard & Prentice, Ltd. Ord.	45/-	45/-			
,, 7% Non-Cum. Pref.	31/10½	31/10½			
,, 4½% Defe. (Reg.) Red. (£100)	£106	£106			
Gas Light and Coke Co.	28/-	28/-			
,, 4% Consolidated Pref. Stock (£100)	£106/10/-	£106/10/-			

## Books Received

**Kolloidik.** By Priv.-Doz. Dr. A. von Buzagh. Dresden and Leipzig: Theodor Steinkopff. Pp. 323. RM. 1650.

**Elementary Practical Chemistry.** By Arthur I. Vogel. London and Glasgow: Blackie and Son, Ltd. Pp. 220. 3s.

**Organic Syntheses.** London: Chapman & Hall, Ltd. New York: John Wiley and Sons, Inc. Pp. 104. 8s. 6d.

**The Chemistry of Natural Products Related to Phenanthrene.** By L. F. Fieser. London, Chapman and Hall, New York: Reinhold Publishing Corporation. Pp. 358. 32s. 6d.

## Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for any errors that may occur.

### Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt as specified in the last available Annual Summary, is also given marked with an \*—followed by the date of the Summary, but such total may have been reduced.)

ACHILLE SFERRE, LTD., London, E., dyers and cleaners. (M., 2/5/36.) Registered April 20, charge, to Barclays Bank, Ltd., securing all moneys due or to become due to the bank; charged on shop in Belle Vue Terrace, Gt. Malvern, and 93 Malden Road, New Malden. £186,945 debenture stock, £3,750 mortgages. May 22, 1935.

BECK, KOLLER AND CO. (ENGLAND), LTD., Liverpool, manufacturers of synthetic resins, etc. (M., 2/5/36.) Registered April 14, debenture, to Martins Bank, Ltd., securing all moneys due or to become due to the Bank; general charge (except uncalled capital). "Nil." January 29, 1936.

### Satisfactions

W. H. COWBURN AND COWPAR, LTD., Manchester, chemical merchants. (M.S., 2/5/36.) Satisfactions registered April 22, £30,000, registered June 26, 1926, £15,000, registered December 22, 1927, and £30,000, registered December 7, 1932.

### Company Winding-up Voluntarily

OILSEED FINANCE CO., LTD. (C.W.U.V., 2/5/36.) By special resolution April 23. Mr. Reginald Kusel, Palace Chambers, Bridge Street, Westminster, S.W.1, appointed liquidator. Creditors' debts or claims to the liquidator by May 31.

## Forthcoming Events

**May 4.**—Royal Society of Arts. "Problems of Road Research." Reginald E. Stradling, 8 p.m. John Street, Adelphi, London.

**May 4.**—Society of Chemical Industry (London Section). Annual general meeting of the section. "Water Pollution Research." Dr. A. Parker, 8 p.m. Burlington House, Piccadilly, London.

**May 4.**—Royal Institution. General meeting, 5 p.m. 21 Albemarle Street, London.

**May 4.**—Imperial College of Science and Technology. Hofmann Memorial Lecture by Professor G. T. Morgan, 5.30 p.m. Huxley Building, Exhibition Road, South Kensington.

**May 5, 7 and 8.**—University of London. Three lectures on "Biochemistry of the Sterol Group." Professor A. Butenandt, 5.30 p.m. London School of Hygiene and Tropical Medicine, Keppel Street, London.

**May 6.**—Royal Society of Arts. "The Oil Engine and its Influence on Road, Rail and Air Transport." G. Mackenzie Junner, 8 p.m. John Street, Adelphi, London.

**May 7.**—The Chemical Society. "Rhythmic turbidity in the precipitation of barium sulphate." Dr. E. R. Prdeaux and Mr. G. E. C. Carter; "The thermal decomposition of silver oxalate." Dr. J. Y. Macdonald; "The constituents of natural phenolic resins," Parts I-V, Dr. R. D. Haworth with Mr. W. Kelly, Mr. T. Richardson, and Mr. G. Sheldrick. 8 p.m. Burlington House, Piccadilly, London.

## Chemical Trade Inquiries

The following trade inquiries are abstracted from the "Board of Trade Journal." Names and addresses may be obtained from the Department of Overseas Trade (Development and Intelligence), 35 Old Queen Street, London, S.W.1 (quote reference number).

**Canada.**—A firm of manufacturers of speciality paints, etc., established at Oakville, Ontario, wishes to obtain the representation of the United Kingdom manufacturers of good quality enamel and varnishes. (Ref. No. 313.)

**Holland.**—A firm established at Amsterdam wishes to obtain the representation, on a commission basis, of United Kingdom manufacturers of all kinds of chemicals, and are also prepared to buy for own account on cash terms. (Ref. No. 329.)

**Brazil.**—An agent established at Rio de Janeiro, Brazil, wishes to obtain the representation, on a commission basis, of United Kingdom manufacturers of chemical products for woollen and cotton manufacturers. (Ref. No. 332.)

## Company News

**Park Gate Iron and Steel Co.**—The dividend is maintained at 3 per cent. The directors have allowed £40,000 for depreciation, and have placed £25,000 to reserve. In the year to March 31, 1935, £35,000 was allowed for depreciation, and £20,000 transferred to reserve.

**Broken Hill South.**—A dividend of 12½ per cent. is announced, payable in Melbourne on June 13. The total payment for the year to June 30 last was 30 per cent., against 25 per cent. for 1933-34. The company has since paid (apart from the distribution noted above) 50 per cent. by way of dividend and bonus on the issued share capital of £800,000.

**Virginia-Carolina Chemical Corporation.**—The directors have decided to redeem on June 1 next all the 7 per cent. cumulative prior preference stock, at \$110 per share, plus accrued dividend. Stock certificates must be presented to Central Hanover Bank and Trust Company, 70 Broadway, New York City. The terms of issue provided that the stock should be redeemable at \$110 at any time on sixty days' notice.

**British Celanese.**—The directors have decided to pay on May 30 the dividend on the 7 per cent. first preference £1 shares for the half year ending on April 30, thus bringing the dividend on this class up to date. In order to meet the company's requirements of further working capital, arrangements have been made for the issue and subscription of 500,000 7 per cent. first cumulative preference shares to rank for dividend as from May 1, 1936.

**British Oxygen, Ltd.**—A final dividend of 8 per cent., less tax, is announced on the ordinary stock. A bonus issue of two ordinary shares for every £7 of stock held, involving the capitalisation of £552,372 from reserve, was made last month, and these shares rank for the dividend now announced. An interim dividend of 7 per cent. was paid in November last. The dividend is thus maintained at 15 per cent. for the year on the larger capital ranking as a result of the above bonus issue and also the 276,186 shares issued in July, 1935, at £3 10s. per share.

**Minimax.**—The directors announce that the profits for the year 1935 amount to £35,265 compared with £21,059 for the year 1934. They have decided to recommend a dividend of 12 per cent. against 9 per cent. for 1934 for the year, plus a bonus of 6 per cent., against 3 per cent., and propose to transfer to reserve for staff retiring allowance fund £5,000 against nil; to write off patents and goodwill account £4,507, against £1,189; to place to freehold premises reserve £1,500, against nil, and to income-tax reserve £3,500, against nil, leaving a balance of £17,825 to be carried forward compared with £17,067 brought in.

**New Transvaal Chemical.**—The accounts for the 12 months ended June 30 last show that the profit amounted to £30,558, in contrast with £27,520 for the previous year, while £7,462 was brought in. After payment of the first preference and "A" preference dividends and providing for directors' remuneration, there remains a balance of £13,705 which it is proposed to carry forward. The last distribution on the ordinary shares was 7 per cent. for 1930-31. The company are making to the preference shareholders offers on behalf of Lever Brothers to exchange six Lever Brothers 7 per cent. preference shares of £1 each for seven 6 per cent. preference shares of £1 each in the New Transvaal Chemical Co., and one 8 per cent. preference share of £1 in the New Transvaal Chemical Co.

**Rio Tinto Co.**—It is reported that revenues showed considerable expansion during 1935. Total income at £619,047, compares with £484,732 in 1934, and is actually the highest level since 1930, when total revenues were still appreciably above the £1,000,000 mark. Profit on sales of produce for 1935 was £527,978, against £453,553. The former figure has been struck after charging £88,487 as "estimated cost of labour surplus to production requirements." If account is taken of a similar charge amounting to £101,632 for 1934, the respective figures are £616,464 and £55,185. Dividends and interest received showed a sharp increase—from £31,128 to £41,020. Expenses, taxes, salaries, etc., were reduced from £275,151 to £268,725, and after charging debenture interest and debenture redemption, applied to depreciation, etc., the net balance of revenue is up from £55,114 to £174,280. Dividends on the £1,625,000 5 per cent. cumulative preference capital absorb £81,250, and the carry-forward is increased from £376,722 to £469,752.

**Chemical Bank and Trust.**—Statement at March 31, 1936, shows assets totalling \$602,796,090, comprising cash and due from banks, \$140,899,587; U.S. Government obligations direct and fully guaranteed, \$147,722,820; bankers' acceptances and demand loans, \$91,837,673; eligible paper and short-term notes, \$63,295,080; State and municipal bonds, \$37,918,874; other bonds and investments, \$18,084,086; loans and discounts, \$80,013,908; banking houses owned, \$267,907; other real estate owned, \$6,363,349; mortgages owned, \$5,005,160; credits granted on acceptances, \$7,419,466; other assets, \$3,938,274. On the liabilities side appears capital stock, \$20,000,000; surplus, \$10,000,000; undivided profits, \$11,689,548; dividend payable April 1, 1936, \$200,000; reserved—taxes, interest, etc., \$8,490,925; acceptances outstanding, \$7,841,627; other liabilities, \$1,165,960; deposits, \$509,708,028; total, \$602,796,090.

**J. C. and J. Field.**—The directors announce that, in order to release undistributed profits, they have called up the outstanding liability of 9s. 10d. per 10s. share on 125,000 ordinary shares. The remaining 125,000 ordinary shares in issue are fully paid. The existing ordinary capital structure, it is noted, has been unsatisfactory in regard to the equitable disposal of reserves and available profits. It will now be possible to recommend at the next annual meeting a bonus of 5s. per share, free of tax, on all ordinary shares, which will absorb £62,500—against £61,458 to be received from share calls—and will leave the company with adequate funds for development. The company's year closed on March 31, and the directors expect to be able to repeat last year's ordinary distribution of 12½ per cent., in addition to the bonus payment noted above. It is expected that the annual meeting will be held early in June.

**Reckitt and Sons, Ltd.**—A profit of £1,158,362 is reported for 1935, compared with £1,161,934 for 1934. The figure is struck on the usual basis, and declared as "(subject to a pooling agreement), including dividends, interest, and after depreciation, tax provision and other reserves and pensions." The small decline in profits on this basis is, however, more than offset by lower debenture service following redemption of the 4½ per cent. second stock in April last year. Additionally, the staff bonus under the "Prosperity Sharing Scheme" has fallen from £115,000 to £113,500, and net profits available for dividend are thus above the £1,000,000 level, for the first time since 1932. The actual net figure—£1,015,653—compares with £991,137 for 1934 and £984,481 for 1933. Ordinary dividend and bonus payments again total 22½ per cent. for the year, and the directors are repeating the general reserve transfer at £100,000, making a total fund of £1,450,000. Over the past two years sums totalling £101,735 have been credited from investment appreciation and transferred to investment reserve. This year, however, a net depreciation of £21,865 is deducted from a total fund of £229,000. The carry-forward is up from £149,792 to £176,660.

**Lovering China Clays.**—The profit for the year to March 31 last amounted to £18,481, against £9,924; after providing for debenture interest at 6 per cent. £11,838, allocation to sinking fund for debenture redemption £2,662, and tax £2,259, the net loss is £1,278; debit balance of £49,469 brought in is thus raised to £59,748. Six per cent. debenture interest payments and operation of sinking fund are both subject to moratorium, under terms of which company is obligated to distribute to debenture holders whole of its profits, to nearest quarter per cent., for years ending March 31, 1936, and March 31, 1937, so long as arrears of interest and amortisation remain unpaid. Accordingly, £17,929, less tax, is to be distributed to debenture holders on May 6 in the form of an interest payment of 7½ per cent. This means that the company is now able to meet its annual 6 per cent. debenture interest in full, and to make a small reduction in accumulated arrears equivalent to a distribution of 1½ per cent. Company's ability to continue this reduction is dependent on maintenance by English Clays Lovering Pochin and Co. of present rate of ordinary dividend.

## New Companies Registered

**Metal Conversions, Ltd.**, Fenton House, 112/113 Fenchurch Street, London, E.C.3.—Registered April 27. Nominal capital £2,000. To acquire from C. Robinson the benefit of certain secret processes relating to the transmutation of metals, and to carry on the business of metallurgists, metal workers, iron and steel converters, founders, electro-metallurgists, electro-depositors and electro-platers, electro-chemical cleaners, etc.

**Petts Proprietaries, Ltd.**, 28 Queen Street, Albert Square, Manchester, 2.—Registered April 27. Nominal capital £1,000. Manufacturing, research and analytical chemists, etc. Directors: Frank B. Holt, Chas. F. Shaw.

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